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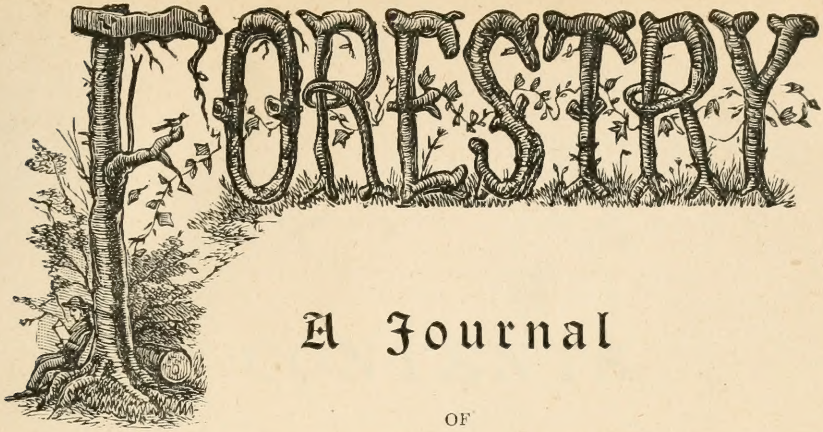

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A Journal

OF

FOREST AND ESTATE MANAGEMENT.

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EDITORIAL NOTES.

THE SCOTTISH SCHOOL OF FORESTRY AND MUSEUM.—Our advertising columns indicate how this movement progresses. Doubtless not a few readers will aid in extending the subscription list during next month.

The meeting of the committee, held on the 9th ultimo, was presided over by Dr. Cleghorn, when the Lord Provost of Edinburgh (who, along with Lord Lothian, was unable to attend) was accorded thanks for introducing the matter which the committee met to promote, before the Convention of Royal Burghs in the beginning of April. Letters from Sir James Gibson-Craig, Bart., E. A. Stewart Gray, Esq., and Sir James Campbell, containing many useful suggestions on the subject of a Forestry School with Museum attached, were read and considered. It was resolved that the circular already sent to the guarantors of the late Exhibition should now be circulated amongst members of the Highland and Agricultural Society, all members of Parliament, and all Burghs in Scotland.

BELGIAN FORESTS.—The report of a Royal Commission published about the close of last year shows that the Belgian forest regions under State inspection comprise a total of 178,978 hectares, of which 24,879 hectares belong to the State, 149,534 are communal property, and 4565 hectares belong to public establishments. These are divided into six inspection districts, four sub-inspection areas, and twenty-two cantonments. The Commission propose a new scheme of administration.

FRENCH FORESTAL POLITICS.—The recent changes in the French Cabinet have necessitated the resignation of M. Meline, the Minister of Agriculture, who did so much for the State Forest Service during the late crisis.

At the *Union Génèrale* of the wood merchants of France, held on the 8th March, such strong protectionist measures were advocated as the sole use of native woods for State purposes, and the imposition of a heavy *octroi* tax on all foreign wood entering cities. In Belgium, on the contrary, a free-trade policy is being advocated.

Russian Forestry. — A correspondent of the *Irish Farmer's Gazette* was much struck by the complete equipments of the Petrovske Razoumovske School of Forestry. The laboratory and museums are very extensive, and most careful investigations into the blights of trees are undertaken.

The forests are rapidly diminishing; wood-stealing by the Russian peasant, who looks on this in the light of tenant-right, is a main factor; and to this may be added the necessities or extravagances of landowners, who do not replace by young plants the trees ruthlessly cut down for immediate profit. The cold of Russia, too, retards timber growth.

Legislation in Pennsylvania.—The *Philadelphia Weekly Press* urges forestry legislation in behalf of its own State. The organized movements in New York and Ohio should spur the friends of sylviculture in Pennsylvania to begin agitating the subject. But the mere organization of forestry associations and the enactment of laws will never accomplish the reform needed. The State of New York contains a wide expanse of neglected land, the site of the Adirondacks, and therefore easily available for that planting so urgently needed to provide a steady and unfailing supply of water for the Hudson River and the Erie Canal. But the corresponding area of Pennsylvania is cut out into small holdings; and one ill-informed farmer may render nugatory any efforts of a dozen wiser neighbours. A thorough education in forestry principles is therefore the main requisite to urge these small holders to profitable action.

Canadian Timber Limits. — From the *Ottawa Free Press* it appears that there has been a considerable ado in the Dominion Parliament because of the cession of Government timber limits for apparently inadequate considerations to sons and other connections of several colonial M.P.'s. Amongst these grants is one of 50 square miles on Smoky Lake, a tributary of the North Saskatchewan, in the district of Alberta, for 250 dollars, one year's ground rent, which at the time was not surveyed.

Central America.—In view of probable complications betwixt the republics of Mexico and Guatemala, the prices of all sizes of mahogany are expected to rise.

ARBOR DAY.—Proclamations were issued during April by the proper State authorities, masters of State Granges, and the like, for the observance of a day, whose date varied according to local requirements, but during which members of Granges and all others were to occupy their time in planting trees, shrubs, and vines, not neglecting to treat also in such fashion the roadsides bordering lands thus improved. Special attention was to be given to the embellishment of schoolhouse and public grounds. Members were to assemble in their halls on the evening of the day, when amongst the exercises appropriate to the occasion prominence was to be given to arboriculture and floriculture.

CANADIAN FORESTS AND THEIR MANAGEMENT.—In a long article in the *Montreal Herald*, Mr. Edward Jack keeps "pegging away" at this topic. The no-system of forest conservancy, the non-separation of timber lands and those fitted for settlement, with the lack of organizations to prevent forest fires, or to ameliorate their dire consequences, are rapidly destroying the Dominion's forestal patrimony. But above all, speculators have acquired timber limits at an old song, to be resold at fabulous profits, as is known by some Edinburgh victims. Thus a block of timber-covered land was acquired for 1000 dollars, held for 13 years, and then sold for 60,000 dollars. Here all that was merchantable was the *right* to cut, as the Government reserves the *solum* of the ground.

PUGET SOUND.—Now, as all eyes are fixed on the uneasy movements of the great Northern bear, it may be worth while to call attention to this great natural harbour, 200 miles long, with a literal line of 1800 miles, just opposite Russia's Pacific territories. It is surrounded by a thickly-timbered belt of fir, cedar, alder, maple, and other woods. In Western Washington there are 20,000,000 acres covered with timber, equalling in area that of the six most populous of the eastern North American States; it averages 25,000 feet of lumber to the acre, or a total of 500,000,000,000 feet of lumber, which, if overtaken at the rate of the 25 companies operating on this vast territory, would take 1000 years to cut down. Such a country, where the fir trees sometimes attain the height of 250 feet, yielding planks of lumber sometimes 100 feet long, with innumerable natural harbours, and with water-way where the merchant marine of the world may obtain lumber supplies, is, in the light of future contingencies, worth looking after.

The War Outlook.—As we write, the beam which for a week swayed nearly to the equilibrium of peace now kicks decidedly on the war side. Of course this may mean a decided change in the price of timber; anything may be better than the hand-to-mouth *régime* of the market during the last month. It is too soon to discount possible eventualities; in any case, a blockade of the Baltic would tell materially on wood merchants' supplies. Last year we imported from Russia 235,339 loads of hewn wood and timber, and 1,100,819 loads of sawn or split wood and timber, respectively valued at £437,438 and £2,353,260. Of course Bismarck's proposed import duties may divert Scandinavian timber from the German to British ports; and even did Russian privateers scour the seas, they would seek richer booty than Canadian lumber ships.

Sir John Lubbock's Motion.—In consequence of the needs of the Redistribution Bill on the time of the House of Commons, this motion is again postponed till 15th May. Petitions in its favour may yet be organised.

EDINBURGH NEWS NOTES.

A MONTH mostly of bleak east winds keeping back vegetation for three weeks beyond its usual spring appearance, has compelled your correspondent to study men in public meeting assembled, and there have been abundant opportunities.

The ancient Convention of Royal Burghs, the representative of the defunct Scottish Parliament, at the instigation of the thorough-going Lord Provost of Edinburgh, unanimously resolved to petition the Houses of Legislature now in session to appoint a committee to consider whether, by the establishment of a Forest School or otherwise, woodlands could be rendered more remunerative; a help this to Sir John Lubbock's motion in the Commons, when the exigencies of the present war crisis allow it to be brought forward.

Professors of education ought to be able to pass an examination in such repertories of general knowledge as Whittaker's *Almanac*, ere impugning the proposal of the Treasury authorities to hand over the Edinburgh Botanic Gardens to the care of the University. Dublin and Cambridge Colleges have botanic gardens under their special keeping, though it is quite true that the Glasnevin—Dublin garden

—is under the Department of Science and Art. It might be well were the Edinburgh institutions under similar tutelage. In this case there would be no threats of cheeseparing of the estimates, no neglect of the Arboretum, and no lack of a home for the School of Forestry Museum.

THE importance of Ben Nevis Observatory, situated as it is as if up in a balloon, was prominently brought forward at the half-yearly meeting of the Scottish Meteorological Society. Because of this, extensive weather changes may now be more confidently predicted than ever. The partiality of sparrows for spring crocuses and other such early flowers was the prominent theme of the Edinburgh botanists; while Mr. Kinnear proved to the Geological Society the prevalence of fossil scorpions in the well-searched fossil strata of Fife and Edinburghshire. The indications, which were not understood till three years ago or so, had been neglected by the most distinguished Scottish palæontologists, so little do we, after all, know of that ancient life which geologists have for fifty years been so assiduously studying.

THE tables of ornamental and greenhouse plants shown at the spring meeting of the Royal Caledonian Horticultural Society, both by amateurs and nurserymen, were alone in themselves an education in the beautiful. Added to this was an unique display of spring flowers and foliage. There were 10,000 visitors during the first day, and 7500 on the second day. This Society is one of the oldest, if not the oldest in the kingdom, and offers a larger amount in prizes than is done by any other horticultural society. It has existed for three-quarters of a century, and its vigour is increasing with its years.

DIXI.

ALEXANDRA PALACE EXHIBITION.

THIS Exhibition was opened on 31st March, by Lord George Hamilton, M.P. It is to be regretted that the Forestry department is so weakly supported. On asking one of the officials for the Forestry section, we were informed that it was scattered throughout the general Exhibition. The following may be noted amongst those exhibits which partake more or less of a forestal character.

Mr. Richard Hartland, of the Lough Nurseries, Cork, has a very well arranged case of sections of Irish-grown woods useful in promoting native industries. These, with a few exceptions, have been collected at his own nurseries and neighbourhood; they principally comprise those trees which are used in commerce. Alongside this there is a case containing a collection of cones of the commercially valuable varieties of pines, these also being chiefly gathered from trees growing in the south of Ireland. Attached to this case there are coloured engravings of the "*Wellingtonia gigantea aurea variegata*," in the culture of which Mr. Hartland has been peculiarly successful.

Near the above stand Mr. A. G. Jackman, landscape gardener, Woking, Surrey, exhibits plans for landscape gardening, comprising designs for a park of 30 acres, and a gentleman's grounds of six acres, also gentleman's residence, garden, and grounds of 2 acres, all of the most approved and suited to requirement type. Messrs. M. C. Duffy & Son, the well-known turners of Bermondsey, London, S.E., show a large number of patterns of their various wood manufactures, comprising ordinary balusters, drop balusters, pitch pine balusters, newels, table legs, hand-rails, also the wood flooring blocks, 18″ × 3″ × 3″, which have been largely adopted by the London School Board for use in their schools. Messrs. Thos. Smith & Sons, of Hurstmonceux, Sussex, have specimens of their truck baskets for agricultural and gardening purposes. Messrs. William Miller & Son, of Monmore Green, Wolverhampton, have on view types of their fencing manufacture. Their patent rivetless hurdle is a substantially made piece of workmanship, and has taken prizes at several exhibitions. At this stand may also be found tubular fences of all descriptions. Mr. H. Staynes, instructor in carpentry, 41 Avenue Road, Clapton, has a neat little stand with specimens, showing structure of the most commonly-used British and foreign woods. His specimens have been cut with a view to showing the structure of the wood cells. One case contains minute wood sections mounted on slides for examination under the microscope, while another case contains microscopic slides photographed by a camera, to show a large view on a screen to a class, so that the structure can be readily described to a large number of students. Another lot of Mr. Staynes's exhibits is a set of joints in woodwork made chiefly by his students, and a number of most curious and intricate joints, of his own design, which attract much attention. Some of the latter show exceptional skill and excellence.

Messrs. Munkedals Aktiebolag, of Uddevalla, Sweden, has sent forward specimen rolls of their glazed and unglazed buff wrapping-paper manufactured entirely from wood: it is remarkable what a firm and tough paper can be produced without the aid of other fibre. Messrs. E. Mossman & Son, boat-builders, Richmond, have on view a model four-oared pleasure boat.

THE NATIONAL LAND COMPANY.

PERHAPS the most notable phase of the present agricultural depression has been the meeting at the close of last month, in Willis' Rooms, St. James' Square, London, to inaugurate this Company, which is to essay the experiment of Fergus O'Connor, which failed because attempted in the most reckless utopian fashion of parcelling out large estates *en morcellement.* Home colonization now proposed by the Duke of Argyle, the Duke of Westminster, Lord Derby the Right Hon. G. T. Goschen, M.P., and *confrères,* may be either a great success or failure, just as the many subsequent teachings of experience are heeded or despised. The new Company may cite accomplished facts and figures to aid in the proper disposition amongst farm labourers of the farm in Berks of 400 acres, which Sir R. Loyd Lindsay has placed at its disposal. The successful co-operative tillage of a farm in Warwickshire, which the landlord, when it was thrown on his hands, placed in those of twelve agricultural labourers headed by his former land-steward, at the same time acting as banker, and the determination of the authorities of Balliol College, Oxford, to place their Upton Hill farm of 400 acres under the same management, together with the cleanliness, thrift, and hope engendered by this associative plan of farm working, have made it a necessary factor of this new movement. The Company also suggest that labourers may buy of them, by payment by instalments, now long worked in building societies, patches of eight or ten acres in contiguity on one estate, the owners of which may hire out their days' labour to the neighbouring large farmers, as indeed is already done on rented land. A pair of horses, kept by one man who would be an independent farmer, might do the ploughing, etc. A number of yeomen proprietors and cottagers, all acquiring their lots by deferred payments, or having their rents fixed as a perpetual charge on the value of the land, might also occupy a part of the same estate with the co-operators.

Such divisions of estates into small lots demand unity of plan for their successful accomplishment. Thus no fewer than 400 head of poultry are fed on the Warwickshire co-operative farm above alluded to; its eggs and butter produce about £6 per week. All this may have influenced the Michaelmas division of profits, which last year ran from £2 to £5 each labourer, besides his 15s. of weekly wages and perquisites. In such cases the local market must dominate the details of cultivation. Further, a single crop is usually the leading feature of the most successful systems of the *petite culture* proper; whether that be flax or fruit, suitable manufactories must exist co-ordinately. Do not the present Russian war complications point to this as a suitable time, by the help of the small culture, whether at home or in the colonies, to grow our own fibres? What a large farmer will not trouble himself with, may be the staff of life to the small grower, provided, as in Belgium, steady markets are at his door. The Flax Supply Association appears to have languished in Ulster, mainly because the small cultivators have not an agency ready to buy from them the flax crops of their fields, subsequently preparing them by the most approved processes for the market. Thus, too, jam factories or the like should be near fruit-growing colonies. Here, again, is a distinct outlet for such societies as the National Land Company.

Further, might not estates near great cities, and having proper railway facilities, subdivided in the fashion of the National Land Company, afford healthy and profitable outlet for the great middle class besides merely labourers? Professor Arnold has been telling Americans how well his farm of five acres, within three miles of Rochester, is doing. One acre is in apple trees, one to two in corn, manured in part by poultry manure, one in raspberries (Doolittle), grown chiefly for drying. He has forty hens and one cow, kept solely on the soiling system, as there is not a rod of pasture on the place. He estimates his profits at 600 dollars. Now this is a moderate profit in the light of some British instances of fruit-growing. But there is also the health and happiness unknown to toilers in populous city pent. Schemes such as Mechanics' Institutes, started expressly for the intellectual advantage of the labouring masses, have, in fact, bettered those immediately above them in the social scale. Such, perhaps, may also be the fate of the operations of the National Land Company. Whether by fruit or fibre farming, or more directly by the way of such mutual help we have indicated as outlined in the Company's prospectus of colonists tilling their eight or ten acre lots by mutual co-operation in ploughing and the like, a more intense cultivation with a corresponding increase in the crops might follow. In any case, the experience of reformatory schools when cultivating good land, of £15 instead of £8 per acre, might be obtained. Of course the laying out of plantations should be an important and profitable feature of all such schemes.

RUSSIAN TEA-GROWING.

INDIAN and China tea-growers had better look to their laurels. The Russian Government, which have been experimenting for some time past in the cultivation of tea, are once more putting forth all their energy to develop the tea plant in Western Asia. They have decided on laying out a plantation at Soukhum Kale, and importing a ship-load of Chinese coolies to work it. Here they have followed in the footsteps of the British Consul at Tiflis, who, not very long ago, grew a quantity of tea, and during the course of last summer, a German, who tried an experiment with a number of shrubs imported from China, succeeded to some extent. These, however, have been one and all tentative measures, and give one result in establishing the fact that tea can be cultivated in the Caucasus; but the important problem yet remains undetermined, whether it can be grown on such a large scale as will enable it to compete successfully with the article which is produced in India and China. As matters at present stand, all the tea consumed in Russia has to be imported—that is, 72,000,000 lbs. have to be purchased at a cost of £6,000,000. Half of this quantity is conveyed to Russia overland across Siberia, and the other half borne by water to Odessa in the Black Sea and Kronstadt in the Baltic. If the experiment to be tried at Soukhum Kale is a success, the foreign article will be at a discount, since Soukhum Kale is only a couple of days' run from Odessa. But there is another and an important factor in a consideration of the question; labour is at a premium in the Caucasus, and the moist climate of the country would materially interfere with emigration on a large scale. In this respect the Indian and China coolie have the advantage, and besides, there not being much capital in the country for the development of the industry, the assistance of foreign capitalists must needs be called in, and here the difficulty begins. Be that as it may, we have no doubt Indian tea-growers will watch with some interest the operations of the Russian Government in this direction.—*Indian Agriculturist.*

THE WILLOW OAK (*QUERCUS PHELLOS*).

BY SAMUEL PARSONS, JUNR.

OAKS are so seldom planted on the lawn, that when one is found there, it will be safe to assume that it grew from self-sown seed. The reason for this neglect by the lawn planter is evident. Oaks are considered slow-growing, and they are hard to transplant by the methods usually employed. Now, it is true that no art can make the oak transplant as easily as the willow; but if trees are used 5 or 6 feet high that have been transplanted within three years, a great deal of the difficulty will vanish. And the objection that a tree takes some time to develop its full beauty is surely not a weighty one, provided the attractions are as long-lived as those of the oak. Many of the oaks, moreover, attain stately dimensions in a score of years, which is certainly not a long time to wait, considering the periods required for the development of some of our best lawn trees.

The willow oak, however, is not one of the loftiest of the genus, but its unique character and the attractiveness of its appearance, when even partially developed, abundantly repay the planter for the length of time consumed in its growth. This oak is found as far north as New York, and southward as far as Georgia and Florida. It is an erect, sturdy tree, with young shoots straight, spreading, and wandlike. The bark of the trunk and main branches is smooth, black, and seldom cracked, and, like that of the beech and birch, constitutes one of the specially attractive features of the trees. The leaves are quite entire, narrow, and tapering at each end, with a small tip or point. Their resemblance to the willow leaf is completed by a bright shining surface. These leaves are frequently persistent to a considerable degree, remaining on the tree late in the fall, and sometimes all winter. The acorns are roundish and small. In its native habitat, and under favourable conditions, the tree often attains sixty or seventy feet in height. Of rounded contour and solid, sturdy growth, the willow oak should be classed on the lawn planter's list with such trees as liquidamber and sour gum (*Nysa sylvatica*). There is a distinctly quaint, striking quality about its attitude and general aspect that attracts the eye at once. It should on this account be planted in isolated positions on the lawn, or in gatherings of its own kind.

Although the willow oak is not often found in our nurseries, if inquiry were only frequently made for it, I have no doubt the supply would in a few years equal the demand, for it could be readily propagated from either seeds or grafts. The trouble is that most people do not care to know many trees possessed of the best lawn-planting qualities.

ITEMS DISCUSSED IN PREVIOUS NUMBERS.

Willow Culture in America.—The growth of osier willows in the State of New York has not been profitable. Cheap, almost surplus labour appears a necessity for the culture of this crop; and it appears that national periods such as the continental war time at the beginning of the century, when England awoke to the necessity of replacing within its own borders the osier supply previously imported from Holland, are best for its prosecution. Only then will the willow culturist appreciate the sentiment of the Roman agriculturist of Cato's time who ranked his willow-field next in importance to the vineyard.

The varieties which flourish in England fail in New York State at least. Neither the true osier, *Salix viminalis,* nor the Longskin, the Bedford, or the Huntington willow, flourish across the Atlantic. On the other hand, the Forbes willow, *S. Forbyana,* the long-leaved willow, *S. triandra,* and the purple willow, *S. purpurea,* appear best adapted to the climate of America.

A Cure for Pot-Twisting.—A correspondent, dating from Long Island, in the *Albany Cultivator* advocates—

Boxes for Seeds and Young Plants.—"My seed boxes are 9 or 12 inches square, 1 inch deep, and made of second class factory strips which run 1 to 2 inches wide, 16 feet long, and cost a dollar a hundred. One inch is deep enough; there is no need whatever for deep boxes with a lot of drainage in the bottom, then some fine soil on top. I use no drainage, and do not want any. In the bottom of the boxes are slight apertures. These boxes are excellent for pricking off small seedlings into. Being square and all of one size allows them to be packed closely and economically, so far as room is concerned.

Boxes for Young Plants.—These are of different sizes—from 15 to 20 inches wide, 16 to 30 inches long, and 2½ to 3½ or 4 inches deep. I buy the empty cracker, soap, and other boxes at the grocery stores for eight cents each, the price the grocers are allowed by the manufacturers for returned empties. I cut these boxes lengthwise into three parts, and in this way get two complete plant boxes (one from the top and one from the bottom), and all except the bottom of a third one. The bottoms of these third boxes are supplied from factory strips, or a few boxes laid aside for furnishing bottoms only. Of course, the boxes got from the top and bottom cuts are close-bottomed, and that will not do for plants; but a man, with a brace and bit and a sharp hatchet, will fix seventy to a hundred of them in an hour.

The Advantage of Boxes for Young Plants.—When young plants are raised in pots, their roots become root-bound, or twisted into a tight mass; if at planting time we undo these balls of roots, it will for a short time materially check the growth of the plants, and if we set out the plants without unfastening their roots, the roots never become uncoiled, and although the plants may wilt less at the time of setting out, they do not afterward grow as thriftily as those do whose roots were not coiled into a mass; and, too, they are more susceptible to injury by drouth. And more especially, as for one-season plants, like geraniums and coleuses, should we avoid pots for young perennial plants, as hollyhocks and pentstemons. Plants in boxes need less care in watering than do those in pots. In moving boxes from one place to another, we move 100 plants with as much ease and as quickly as we would six or seven in pots."

SHARPEN YOUR AXES.

THERE now lie before us an assortment of "Tam o' Shanter" Hones, manufactured by Mr. John C. Montgomerie, of Dalmore, Ayrshire, admirably adapted for this, as well as for giving a workman-like edge to the divers implements used by joiners and carpenters, foresters, sheep-shearers, as well as those who forswear the beard movement, or who, despite ensnaring advertisements, eschew steel pens. The Water of Ayr stone, probably an altered argillaceous shale, is one of the unique beds in the British strata, possessing the requisites of a Hone stone; and Mr. Montgomerie has made his manufacture a speciality—both in the selection of stones of varied grain just suiting the special tool requiring sharpening, and in the beautiful ornamental polished wood cases in which the manufactured products are enclosed.

French Sylviculture.—In the section of Sylviculture of the Society of French Agriculturists it was determined to offer a prize for the best means of utilizing accessory forest products in such ways as paper pulp, black alder charcoal for powder works, wool from pine scales, and vine props from injected pine-wood. Another prize is also to be offered for a memoir indicating the various circumstances needed to make a definite forest region give the best sylvicultural results.

A DAY IN AN ENGLISH PARK.

BY D. F. MACKENZIE, MORTONHALL, MIDLOTHIAN.

Part I.

I RECENTLY had an opportunity of realizing a long, wistfully-desired visit to Cirencester Park, the property of the Right Hon. Earl Bathurst, one of the largest, certainly one of the most beautiful of those English parks, which are so prominent in their display of the science and practice of arboriculture. Through the courtesy of the noble proprietor, I minutely inspected the specialities of this domain in a day's visit,—a task that might otherwise have been spread over a week; and I shall try to have your readers share in my arboreal delights.

I have said the park is large and beautiful; it is also useful, every yard of surface being utilized to the best advantage. To the minds of Scotch foresters generally, a park means an enclosure from a score to several hundreds of acres, securely fenced against the public, studded and belted with trees, usually adding greatly to the expense rather than increasing the revenue of the owner. The Cirencester Park, however, is the reverse of this. It covers an area of many thousands of acres, intersected by over sixty miles of rides, drives, and shady, well-kept walks; the scenery is varied and beautiful, the surface being gently undulating and well covered with trees, of diverse ages and varieties. It also contains several ornamental and architectural buildings said to have been designed by the poet Pope, during the life of the first Earl Bathurst, as well as a lake of considerable area and beauty, together with a large deer park, well stocked with the "denizens of the forest."

Great effect is given to the scenery by the arrangement of the rides and drives, which divide the whole area like a network, and at irregular distances, each different from the other.

Lying as they do, close to Cirencester, the house and park are shut out from the town by a massive stone wall, between which and the mansion is a magnificent yew hedge, well trimmed, it being only a little over 2 feet in thickness, though over 35 feet in height. The line of this hedge represents the section of a huge Gothic moulding, having the house as its base. Within its lines are gravelled walks and a parterre, all in harmony with the surroundings.

The principal avenue, called the "Broad Ride," is one of the

THE CATHEDRAL FIRS (*Engraved expressly for "Forestry"*).

longest in England; it is over six miles in length in a straight line, and about 50 yards wide, flanked on each side by limes, chestnuts, beeches, firs of various kinds, including many beautiful cedars. About one-third of a mile from the main entrance at Cecily Hill, is a hexagonal stone erection, one of those said to have been designed by Pope, who appears to have had considerable taste for landscape gardening, which in his day was considered an art worthy of a king to practise. Indeed, in this very erection he may have composed his poetical epistle to the then Lord Bathurst, on his judicious use of riches :—

"The sense to value riches with the art
T' enjoy them, and the virtue to impart
Not meanly. Nor ambitiously pursued,
Not sunk by sloth, or raised by servitude :
To balance fortune by a just expence,
Join with economy magnificence :
With splendour, charity : with plenty, health :
Oh, teach us, Bathurst ! Yet unspoiled with wealth !
That secret rare, between the extremes to move,
Of mad good-nature, and of mean self-love."

Still farther on, we come to another monument of the poet's skill in this line, called "Pope's Seat," near which a beautiful view is obtained of the park and surrounding country. Many avenues radiate in every direction from this spot. At the diverse extreme ends may be seen a church spire or other conspicuous object, as if built on purpose to complete the general harmony. Pope may have been led by this varied landscape to conceive the following :—

"Who then shall grace, or who improve the soil ?
Who plants like Bathurst, or who builds like Boyle ?
'Tis Use alone that sanctifies expense,
And Splendour borrows all her rays from Sense.
  His father's acres who enjoys in peace,
Or makes his neighbours glad, if he increase ;
Whose cheerful tenants bless their yearly toil,
Yet to their Lord owe more than to the soil :
Whose ample lawns are not ashamed to feed
The milky heifer or deserving steed :
Whose rising forests, not for pride or show,
But future buildings, future navies, grow ;
Let his plantations stretch from down to down,
First shade a country, and then raise a town."

It would thus appear that Pope was well "versed" in forestry, and the train of thought expressed by him above, which is not only quite applicable to the park as it stands to-day, but also to the traits of its present noble owner, who unstintingly allows the public at large, whether on foot, or mounted, or in carriages, to walk, ride, or drive at pleasure through the park, thus sharing a pleasure that a fortune could not buy them.

The "Ivy House" and "Alfred's Hall," or the "Woodhouse," are all monuments of the mason's art, and worthy of a visit. The latter consists of a fine Gothic hall, having beautiful stained-glass windows, and a fireplace admirably suited for the burning of the "Yule log." In this hall there is a large and varied collection of Indian weapons of warfare, and many other curiosities second to none exhibited at the Forestry Exhibition recently held in Edinburgh. Picnic and other parties are admitted by ticket, gratuitously issued on application to his Lordship's factor, Mr. Anderson, The Barton. Near to this hall the forest scenery is very fine.

NEW YORK CENTRAL PARK FORESTRY COLLECTION.

SPECIAL operations in progress at the Old Arsenal at Central Park are novel both as to method and motive. The work includes various technical processes preparatory to the permanent exhibition of forestry, of which some portion of the specimens have been placed already in the Museum of Natural History. It has been hoped that the entire collection might be arranged and opened to public view during the present spring. The exhibition is to be arranged within one large case extending throughout the length of the great hall, and in six smaller cases placed next the wall along either side.

The collected specimens amount to 420; in addition will be a few of difficult access yet remaining to be obtained. About 400 specimens form the census collection made under the direction of Professor C. S. Sargent, Arnold Professor of Arboriculture at Harvard, acting as chief agent of the forestry department for the tenth census publication. From this work was developed the idea of the present museum exhibition movement, the latter also in charge of the Arnold Arboretum; the financial means being provided through the generosity of Mr. Morris K. Jessup. The preparation of the specimens is entrusted to Mr. S. D. Dill, who performed the same service in an excellent manner for the census collection. The present scheme has been his exclusive occupation already for two and a half years, with two assistants since March of the past year, instead of one, as previously.

A specimen consists of a section of about 5 feet 8 inches in length, taken from the trunk of a tree, with a partial section, including half or more of the diameter and in length about one-third of the whole piece, cut down and removed from the top; in this way the inner vertical and the horizontal surfaces are shown at once. Only half of each of these exposed portions is polished in order to illustrate the effect of the treatment; the top of the remaining upper portion is neatly finished by bevelling.

The dimensions of specimens range from 2 inches to 6 feet in diameter, the California pine showing the latter large measurement. A plank of redwood (*Sequoia sempervirens*) is also included, which measures 8½ feet in width.

Without extension to the innumerably multiplied varieties, the collection will represent every native species of this country. Each specimen is to be accompanied by a placard giving both the local and the scientific name, the study being rendered of further advantage by numbering in duplicate trees of corresponding species in Central Park. The plan includes also the publication of a descriptive catalogue. Another useful feature in addition will be that of the drawings of leaves, flowers, cones, fruits, etc., which are being prepared by Mr. Faxon at the Arnold Arboretum. These are to be hung in the exhibition, each above a corresponding specimen in the wood, while a different illustrative series will consist of pressed leaves forming an herbarium.

A course of observations connected with the work may prove scientifically of some aid in arboriculture. In the preparation of the wood at the Arsenal, exact diagrams are drawn from the horizontals as the cuttings are made, and representing the increase in diameter for succeeding years of the tree's existence as indicated by the rings. It is hoped that the record may serve toward a solution of such questions as whether dry seasons affect some or all trees as causing slower growth, and all the data for comparative study are filed away for reference.

A record of the age and diameter of every tree represents in a general way the comparative rates of growth. A tree three hundred and sixty-nine years old which is only 15 inches in diameter is an example of slow growth. This is the *Pinus edulis* or edible pine from Arizona, called also nut pine, and of which the seed, resembling in dimensions a good-sized bean, is used by the Indians for food. The Western shell-bark hickory (*Carya sulcata*) from Allenton, Missouri, which is three hundred and forty-one years old, has a diameter of 37 inches; another tree only one hundred and fifty years old with a diameter of 40 inches represents a different habit of growth. This is the *Tilia americana* or basswood, from the same locality as the last-named species.

The oldest tree in the collection, and which has felt the snows of four hundred and ten winters, represents a species remarkable for slow growth, being only of 24 inches diameter; it is named *Picea Engelmanni* from its discoverer, Dr. Engelmann, being known also as Engelmann's spruce; its locality is from British Columbia to Arizona, and it forms extensive forests in Colorado.

Among rare specimens in view for this collection, but which remains to be secured as circumstances permit, is the *Larix Lyellii* or Western larch, growing in the Cascade and Galton ranges of Oregon at 6000 or 7000 feet elevation; the acquisition of trees so situated is evidently attended by difficulties; even the extensive census collection is destitute of this species.

Woods of handsome appearance include the arbutus, holapensis, sweet bay (*Persea carolinensis*), Alaska cedar (*Chama cyparis nutkansas*), and the beautifully-figured maple burl from Missouri. A species most remarkable for durable quality is the catalpa, of which some of the wood buried in the ground for seventy-five years is brought out in a perfectly sound condition. Among other interesting specimens are the cocoanut tree from Key West, and the finely odorous nutmeg tree from California.

An extremely curious species is the Washington palm (*Washingtoniana filipera*) from Southern California, of which the rings are nearly detached, forming layers of fibrous, bark-like substance lying loosely one within another to the heart; the top of this tree severed from the trunk is also among the specimens, with its immense spreading leaves dried and yellow.

From Texas comes another extraordinary tree formation resembling a fluted column, and known as the *Cereus gigantus*. Its vertical, singularly-curved parts are easily separable, being without attachment of any heart at the centre. The Douglas spruce exhibits an equally peculiar appearance, but from extrinsic cause its bark is thickly perforated with holes of the average size of nuts, the cavities representing an economical system pursued by woodpeckers; after forming these holes, the birds therein deposit acorns, to remain until some future day when required for food.

One of the most interesting curiosities is that of the *Gleditschia triacanthus* or honey locust, from Missouri, of which the body is covered with thorn clusters, shooting outward in all directions from their centres of growth. The base of this thorn formation is in the bark, without any source in the wood beneath or connection with it. These knots or crowns of thorns are therefore easily detached, and it was necessary on this account for the tree to be transported from the West suspended from the ceiling of the car.—*Forest and Stream.*

TREE PHOTOGRAPHS.

AT the April meeting of the Botanical Society, Dr. Cleghorn exhibited, through the kindness of Mr. J. Murray, F.R.S., the album of photographs taken during the cruise of the *Challenger*. A selection of thirty-seven of these will be found illustrating the *Narrative* of that Expedition, which is now published in 2 vols. 4to, and upon which Mr. Murray, assisted by other distinguished naturalists, has been engaged for three years. We may have occasion to advert to this magnificent work hereafter, meanwhile it may be noted that Government considered it best to place the whole of the remaining photographs in the hands of a professional photographer, who repays himself for printing by selling copies at a low price.

Dr. Cleghorn drew attention to the great value of these phototypes, illustrating the vegetation of various countries, and delineating some very remarkable trees, as the Baobab, Dragon tree, Silk Cotton tree, Cochineal plantation, Sago palm, Traveller's tree (*Ravenalia*), etc. He recommended members to visit the studio of Mr. Horsburgh, Edinburgh, where copies of all except those printed in the *Narrative* can be obtained.

A FOREST COMMUNE.

IN the township of Freudenstadt, at the foot of Kniebis, in Baden, not a single farthing of taxation has been paid since its foundation in 1557. The commune possesses about 5000 acres of pine forest and meadow land, worth about £10,000 sterling. The 1420 inhabitants have each as much wood for their building purposes and firing as they wish for, and each one can send out to pasture, during the summer, his cattle which he feeds during the winter months. The schools, church, thoroughfares, and fountains are all well cared for, and every year considerable improvements are made. 100,000 marks were employed in 1883 for the establishment in the village of a distribution of water with iron pipes. A hospital has been built, and a pavilion in the market-place, where a band plays on the fête days. Each year a distribution of the surplus revenue is made amongst the families, and they each obtain from fifty to sixty marks or shillings, and more still when an extraordinary quantity of timber has been sold. In 1882, 80,000 marks were distributed amongst the 1420 villagers.

EMILE DE LAVELEYE, in *Contemporary Review*.

PERSONAL EXPERIENCES IN THE LIFE OF A GARDENER.

By N. ROBERTSON, Superintendent, Government Grounds, Ottawa, Canada.

IN looking over the last number of the *Gardeners' Monthly*, I notice that a correspondent asks how to establish himself as a landscape gardener, and your appropriate remarks thereon. With you, I say that one of the greatest wants of the day is, proper men at the head of our public parks in cities and towns. This does not arise because such men are not to be had, but because, when a position of this kind is open, influence has so much to do with the filling of it. Capability is only a secondary consideration, if thought of at all. Examples are not rare of those who go blundering along, leaving marks that show too plainly that they have never studied the first requisites of what constitute an effective landscape gardener. Errors are easily made, and their repair is costly. A builder can commence his work and carry it into completion in a short time, but a landscape gardener can only lay the foundation of a work which nature has to complete for him in after years.

Your correspondent says he advertised repeatedly and failed. I will relate what my advertisement was which placed me in the position I now hold. I may first say that I was born a gardener, for at a very early age my father saw my inclination was in this direction, and had a gardener come and clean a piece of waste land, and lay out a garden for me to spend my leisure hours in. This garden was my great delight. At the age of fourteen I, as most boys do, thought I had had enough of school, and I wanted to become a gardener. My father and his family were against it, not that they objected to the profession, but there was plenty to do at home on the farm, and there was no necessity for my leaving the family circle. I had a cousin a gardener, and to him I went as an apprentice. As he was a bachelor, and considered crabbed, it was supposed I would not stay long with him. I look back with grateful feeling to him, for he spared no trouble to advance me in the art. He being a man who was constantly on the outlook for progressive matter, my five years of apprenticeship were well spent. The custom being to remove to some other place for a change and a variation of experience, I served one year as journeyman, and then was promoted to the whole charge of the place. On the expiration of that year I took it into my head to try a newer country, greatly to the sorrow of my employer, who wanted me to remain. I sailed for Canada, and on my arrival was employed the same day by an elderly lady, who had a large market garden, and employed many hands. There I spent a year, and then I was put in charge of the place. I can never forget the kindness of this lady to me; better she could not have been to her dearest child. Another year passed, and, ambitious to make progress faster, I left and tried several places, but was not extra successful, being ignorant of the practical working of them. This period covered several years, during which I kept myself posted in gardening by books, etc. It was at this time that my advertisement began. I had bought myself a building lot, and had put up a cottage on the one half of it; the rest I kept for a garden, in which I could devote my leisure hours. I was then running a store on my own account, and the hours for my garden had to be, for the most part, from four to eight in the morning. Now this little garden was my advertisement, and, in a large part, was the means of my getting my present position. I had it so decorated with flowers, etc., that it was a matter of considerable interest to the inhabitants of the city. If any person asked me where I lived, I told them the street, and they would ask, "Is it where the pretty garden is?" Sunday afternoons I used to be much gratified by seeing the crowds of people that came to look in at it. Among them there once came two Ministers of the Crown whom I was acquainted with. In the course of conversation they asked if I understood gardening. I said yes, and related what I have told above of my former life. Well, they said there was to be a good position for a person of that calling at the grounds around our Government Buildings, and asked if I would care to take it, promising their aid if I would. I said I would take it, and thought all was right, but I was told I must get all the influence I could to intercede for me. This was against me, for I had but few to go to. However, I got my papers ready, and here my little garden showed itself again. No one knew me as a gardener, but every one was satisfied I knew what I was about, and I had no trouble whatever to get every name I asked for, which made me renew my exertions. There were many applicants for the position, most of them being men of no knowledge, but who had considerable influence to back them. After a year's waiting in suspense, I got the appointment. My trials broke out afresh as soon as I commenced the work, which was a most difficult one, owing to a large amount of excavation which had to be made to suit a plan for part of it which had been accepted as one fitted for it. It will give some idea of the extent of the work the first summer, to say that 60,000 dols. were spent on excavation alone, and large sums for three years more. The disappointed applicants for the position attacked me at every move, through the public print; so that I got almost ready to give up the place. I got so disgusted that I went into the chief architect's office and told him so. His answer was that as the Department had found no fault, I should go on. He counselled me to pay no attention to them, but to go on as I was doing and I would come out right. I did so, and the result proved the wisdom of his words. The many eulogiums I now hear about the work are very encouraging to me.

If your correspondent should ever be successful in getting a situation as a landscape gardener, let him pray that it be not a public one, for, if it is, he will have to endure many such unpleasant things as I have related, and perhaps a good many more. I may add that my success here has given me two chances to far more lucrative positions, which were very tempting. But when I looked back on the past, and saw the great pleasure I had had since my first years, I said to myself, my cottage and my little garden still remain, and, all things considered, there are associations here that could not be found easily. I have been frequently told I was foolish to devote myself so closely to this work, and that I would never get any thanks for it. I have got thanks a thousand times, until the cup runs over, well repaying me for my exertion. I am glad to see you make public Mr. Miller's affair at Fairmount Park, for this system of exchanging plants is an old-established one, and was almost considered obligatory amongst gardeners in Scotland in my day there, and it would be a good thing if it were more practised than it is. It is a pleasure to find the charges against Mr. Miller so utterly unfounded.—*Meehan's Gardener's Monthly.*

PROFITABLE FRUIT CULTURE.

MR. WATKINS, a practical fruit-grower, in a paper read before the members of the Herefordshire Chamber of Agriculture, cited two successful cases of apple-growing last season that came under his own notice. In one case a small orchard of about three acres was recently planted with standard apple trees of good sorts for table and kitchen use. The trees were properly cared for and manured, and as some sorts were found to be growing too freely, they were root-pruned. The result was a magnificent crop of fruit last season, which realized about £16 per acre after paying all expenses. In the other case an orchard was placed in Mr. Watkins' hands. The trees were a mixture of culinary, dessert, and cider apples, a few of the sorts being inferior; but care was taken in picking and selection, and there was a profit of £15 an acre. In both cases grass was grown in the orchards and paid the rent. On the other hand, he said, there were hundreds of acres of orchards in the county that barely paid the rent, but only because the trees were mostly of inferior sorts, not fit for cider or any other purpose.

Many more than the 188,000 acres of land under fruit in the United Kingdom might be similarly employed if tenants had proper security for their capital, and if varieties suitable to the climate and soil of the district were selected. All sorts of small apples must be discarded by those who grow for profit—such sorts as Court of Wick, Golden Harvey, Old Golden Russet, Downton Pippin, Pearson's Plate, Sam Young, and many others. The following are a few of the varieties which succeed in most soils, and should be extensively planted: Yorkshire Beauty, Keswick Codlin, and Etchinville Seedling for early culinary apples; Beauty of Kent, Warner's King, Mère de Ménage, Hambledon Deux Ans, Blenheim Orange, and Dumelow's Seedling for mid-season and late culinary supply; Devonshire Quarenden, Duchess of Oldenburgh, and Worcester Pearmain for early dessert apples; King of the Pippins (also called Prince's Pippin), Seek-no-Further, Cox's Orange Pippin, Duke of Devonshire, and Devonshire Pearmain for mid-season and late dessert apples; and Cherry Pearmain, Cowarne Red, Forest Styre, and Kingston Black for cider. In an exposed situation, plant rather thickly, say 18 feet to 20 feet apart; but if you have a sheltered situation, with a good, deep, and generous soil, give the trees plenty of room—30 feet or more. Apple or pear trees may be planted alternately with plums; the plum tree is a much shorter-lived tree than the apple or pear, and comes into bearing sooner, thus bringing in a return till the other trees get fairly grown. A strong grower and a small grower may be placed alternately each way. Yet another plan is to plant them in hexagonal form instead of square; that is, instead of the trees being exactly opposite each other in adjoining rows, they are midway, thus giving more room to each individual tree without increasing the distance between or in the rows. In filling up old orchards never plant in the old holes; it is better to get the trees planted irregularly than to do this. Deep digging is essential in planting; but the trees should not be put in too deeply. The want of care in picking and packing the fruit is a frequent cause of loss. Mr. Watkins prefers autumn planting, except in cold, wet soils, where he would plant in spring, not later than March.

THE FORMS OF LEAVES.

AT an April meeting of the Linnean Society, Sir John Lubbock enlarged on some points he had dwelt on in a popular manner in his lecture at the Royal Institution. He said he had long been puzzled at the reason why some plants have cordate leaves, more or less elongated, others palmate. Starting from a foliaceous expansion of a stem, the former was evidently the simpler type. He had suggested that the cordate shape was the earlier, from which the palmate was developed. The interesting consequence would follow, that if in the same genus some species were cordate and others palmate, the latter were of later origin. This explanation presupposed that the palmate form, at any rate under certain circumstances, presented greater advantages. Sir John suggested that this might have reference to the power of self-support and of resisting wind. The weight of the leaf and the force of the wind might be considered as if they were concentrated on the central point of the leaf. Now in palmate leaves the centre would be nearer the point of support, and the resistance to any given force, therefore, would be more effectual. This point was illustrated by experiment. Broad leaves, however, were of two main types—cordate, with veins following the curvature of the edge; and palmate or lobed leaves, with veins running direct to the margin. Now, the fibres constituting the so-called veins of leaves, contained elongated cells running parallel to the veins. Consequently the sap passing up the leaf stalk and into the leaves moved more readily along these fibro-vascular bundles, having fewer cell walls to traverse. It was almost like going along a road instead of across country. The fibro-vascular bundles then acted as pipes conveying the sap, and it is clearly more economical that they should go straight to their destination, rather than wind in a curve. As the sap passes more freely along the veins, the leaf also grows there more rapidly, which seems to explain the common-lobed form of leaf, with a vein running to the point of each lobe.

Referring to some criticism on his views with reference to the relation between the size of leaves and the diameter of the stem, Sir John examined especially those of the conifers. Thus the spruce fir had shorter leaves than the Scotch fir, but they remained on much longer—say seven or eight years instead of two or three, and had a stem as thick or thicker. Amongst other interesting problems presented by leaves, he discussed the probable reason for the larch having deciduous leaves, and for the presence of two kinds of leaves on certain cypresses and other trees.

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(To be continued.)

THE VALUE AND MANAGEMENT OF GOVERNMENT TIMBER LANDS.

By N. H. EGLESTON, Chief of the Forestry Division of the Agricultural Department. One of the Papers read at the United States Department of Agriculture, May 7–8, 1884. Communicated by the Author.

THE value of Government timber lands, like that of all timber lands, is of two kinds. They have a value for their commercial products, such as lumber, bark, resins, seeds, etc. This value will depend upon the character of the trees growing on the lands, their kind, their abundance, their size, their accessibility, the facilities for obtaining their products, the distance at which they are from a proper market, and the character of the demand for them or their products. These, not to mention other considerations, must enter into any satisfactory estimate of the commercial value of any timber lands. This value of timber lands, therefore, will vary greatly with time and place. Fifty years ago, for instance, the great pine forests of Michigan had, we may say, no commercial value, because they were so remote from population, and consequently from market, that there was no demand for what has since sold for millions and made thousands rich. Ten years ago the timber lands of Oregon and Washington Territory had little, if any, commercial value, for the same reason. Now, the completion of the Pacific Railroad, and the approximate exhaustion of the forests of Michigan, Wisconsin, and Minnesota have given a greatly increased value to those lands.

So, again, forests, composed of the best kinds of trees, may be growing on mountain-sides of such altitude and so difficult of approach that they will not pay any one for converting them either into lumber or fuel. Or they may be growing in inaccessible swamps, and on that account will have no commercial value, and the lands sustaining such forests will have no market price.

But timber lands have another value besides that which is commercial, and this may be a higher one than any which can be measured by dollars and cents. This may be called their climatic and hygienic value, though in many cases it blends intimately with the commercial. The most careful and scientific investigations have shown beyond question that forests have a very perceptible influence in modifying climate. They have much to do with the temperature and moisture of the atmosphere in their vicinity and for a considerable distance from them. They influence the atmospheric currents. If they are not direct producers of rain, they affect its distribution.

They have much to do with the flow of streams, and so with all the hygrometric conditions and influences connected with them. They thus become potent factors in determining the character of the climate of any particular region. They have therefore an important bearing upon health as well as upon the agricultural, commercial, and manufacturing interests of a country. Instances are not rare in which the removal of forests has been followed by insalubrity of climate, and the restoration of the forests has been accompanied by its corresponding improvement. The destruction of the forests in many European and Asiatic countries has greatly lessened the agricultural productiveness of those countries. Lands once teeming with valuable grains and fruits have been made almost deserts by the destruction of the forests which once protected them. Streams which once bore the commerce of nations have ceased to be navigable, in consequence of the removal of the forests which formerly sheltered their head springs, while the navigation of other streams is becoming more and more difficult from year to year as the destruction of the forests, in which their head springs are situated or through which they flow, proceeds.

It is plain, therefore, that while some forests may have little commercial value, and on this account may be worthy of little notice, and may not be reckoned among the items of individual or of national wealth, they may be of the greatest importance in other respects, and have a value so great that all the care and power of a nation may properly be called into requisition for their preservation. This climatic or meteorologic value of forests has only recently been recognised to any considerable extent, though individuals—the more thoughtful and observing—have seen it and taken notice of it to some extent from a very early period. But as it has come to be more widely recognised, especially during the last hundred years, and more particularly still during the last fifty, many of the European countries have made the management of the forests one of the most prominent and urgent duties of the Government. In Germany and France, especially, this is the case.

Now, as to the value of our Government timber lands, to the consideration of which this paper is restricted, only an approximate estimate can be formed, for the reason that we know comparatively little about the timber lands belonging to the Government. Strange to say, the Government has taken hardly any account of its timber lands. In the disposal of its lands the Government has gone upon the presumption that they would be used for agricultural purposes. In surveying them for the purpose of selling them, and so defining their boundaries that a satisfactory description and location of them could be given to the purchaser, they have been plotted by simple right lines, running north and south, east and west. The character of the land has been taken into account very little. To some extent the field notes of the surveyors give information as to swamps and wooded lands, but only a special examination by the contemplating purchaser could enable him to decide as to the real value of any piece of land. The vast amount of forests on the public domain, worth more than all its lands if cleared of timber, worth more than all the minerals within the ground, capable of yielding, in connection with private forests, products annually of greater commercial value than the largest cereal crop or that of cotton, the Government has taken no notice of. It has not regarded them as adding one dollar to its assets. It has put no higher price upon a section of land having timber on it worth thousands of dollars than it has upon a section of the poorest open land, destitute of tree or shrub, swept by the blizzards of the north or the siroccos from the Gulf, and favoured with so little rainfall as to forbid any profitable cultivation.

The only recognition of value in timber was in the early years of the present century, when the superior quality of the live-oak for ship-building induced some legislation on the part of Congress for the preservation of the limited amount of that timber growing in some of the Southern States, in order to provide a sufficient supply for the construction of our naval vessels.

In recent years, as great depredations have been made upon the public timber lands in other parts of the country, some efforts have been made to restrain them. But this has been done only to a partial extent, and by certain rulings and constructions by which the Acts referring to the appropriation of the live-oak timber have been made applicable to other timber rather than by any express legislation designed to meet the case. The Government cannot be said to have taken any such action as would indicate that it regards its timber as valuable property, to be guarded and protected as property should be.

If it is asked, then, What is the value of the Government timber lands? the answer must be, We cannot tell, because the Government has not even taken a proper inventory of its lands. It does not know how much timber land it possesses, nor what is its quality. We can estimate its value only approximately. In reply to an inquiry on the subject, the Commissioner of the Land Office says: "There is more or less timber in all the States and Territories containing public lands; but since such lands are not classified as to timber, the proportion of the same in each cannot be arrived at by this office."

Without, therefore, venturing upon any figures to represent the commercial value of the timber lands, inasmuch as we know so little as to the quantity of such lands or the quality of the timber growing upon them, we can only say, and this we can say with all confidence, that the estimated 84,000,000 acres of timber land still belonging to the Government must have a large commercial value.

As to the marketable value of the Government timber lands, while a portion of such lands, on account of present inaccessibility or distance from settlements or important commercial points, may have but little value, much of those lands are saleable, and would be in greater demand than they are were it not for the fact that forest fires render such property hazardous, and that unscrupulous persons find it cheaper to steal timber than to buy it. The very fact also of the plundering of the Government timber lands proves, wherever it occurs, that the timber on such lands has a present market value. Men do not steal what has no value. Even the slight care which the Government has extended to its forests has resulted in the discovery that they have been plundered to the extent of several millions of dollars' worth of timber.

As to the management of the Government timber lands, clearly there should be a change from the course hitherto pursued. It would seem to be the plainest dictate of common sense that the Government should recognise the fact that in its timber lands it has a valuable property besides the lands themselves, and that as a wise proprietor it should care for and protect that property and use it for its own highest advantage. Like a wise property-holder, it should first of all take an account of stock, ascertain how much of this forest property it has, and how much it is worth. At present the Government does not know, except in a very indefinite way, where or what its timber lands are. It does not know how dense its forests are, of what kind of trees composed, how situated, how valuable for one use or another. The first thing a private person claiming to own this property would do, would be to refuse to sell any of it until he had carefully examined it, and, having thus ascertained its adaptation for various uses, had been able to form an intelligent decision as to its most advantageous disposal. Why should not the United States Government act in a similar way? Why should it not suspend the sale of its timber lands until it can make an accurate survey of them and ascertain their character and situation, and their value for one purpose or another?

Having done this, such of its timber lands as it would be desirable to have preserved in a forest state, for climatic reasons or on account of the favourable influence which they would exert upon the flow of rivers and streams, should continue to be withheld from sale, the timber growing thereon alone being sold, and that only by selection of the full-grown trees from time to time, and not all at once as has been the usage with the forests. The trees should be sold by Government officers, who should be known as Forest Conservators, and the trees should be felled under their direction and in such a manner as not to injure the young and growing trees, and the place made vacant should be planted at once, so that the forest should be kept well stocked and in a growing, thrifty condition all the while. This is the way the Government forests are managed in Europe, and they are thus made an important source of revenue, while at the same time they are made the safeguards of public health, and promoters of the general welfare in many ways. So well satisfied are the people of the wisdom of this management, so convinced of the great importance to their welfare of an adequate supply of trees, that the tendency is continually to increase the area of land devoted permanently to tree-growth instead of diminishing it, notwithstanding the increase of population would tend to make inroads upon the forests in order to obtain additional land for tillage purposes. The people have become convinced that the most successful and remunerative tillage cannot be had without the aid and protection which the forests afford, while the trees are their best security against floods and droughts and devastating torrents.

Having thus ascertained what portion of our timber lands ought to be maintained in the forest condition, and taken measures for its preservation as such, the rest might be offered for sale outright as our lands have been in time past, or the timber only might, in this case also, be sold, as it is in Canada, no trees being allowed to be cut that are of less than a certain diameter, and the land itself remaining still the property of the Government.

Such, it seems to me, is the value, and such should be the management, of the Government timber lands. Such a view of the subject implies a change, as has been seen, in the dealing of the Government in respect to its property in lands. It implies an increased expenditure in watching, protecting, and disposing properly of its timber lands. But there is no property of the Government so valuable as this, and therefore so well deserving of expenditure for its protection and preservation. There is no property of the Government the care and protection of which will bring so large a return of profit to the State and of benefit to the people. It is estimated that the value of the annual products of our forests is not less than 800,000,000 dols., outmeasuring the value of our great cereal crop, that of corn; more than that of our crops of hay, rye, oats, barley, buckwheat, potatoes, and tobacco taken together, and ten times that of all our mines of gold and silver. Can we be too considerate or too liberal in expenditure for the care and preservation of such interests?

AMERICAN THOUGHT AND ACTION.

AFFORESTATION OF WASTE LANDS.

THE proposal to afforest deserted farms in Massachusetts was brought forward by Col. Henry Wilson, of Boston, at the State Board. At present prices it will pay to do so, as well as to plough and loosen the soil before planting, and to cultivate the soil for two or three years after this is done; though it will not pay to prune. After thinning out at intervals of five years, and selling the trees removed, in ten or fifteen years you have a well-established forest from which enough has been sold nearly to pay the first cost.

Avery P. Slade recommends white pine for worn-out sandy soils away from the sea-shore, as at thirty years of age it represents more value than any other forest tree of New England.

Zachariah Allen, of Providence, R.I., seeded an old 40-acre pasture worth 15 dols. with a variety of forest trees. An accurate account was kept of the lot for fifty-seven years. It paid 6·92 per cent. on the original investment.

Joseph S. Fay, of Woods Holl, writes that the largest part of a place he bought at Woods Holl some years ago was hilly pasture-land; a worn-out, sandy, gravelly soil, with many boulders. It was exposed to high winds from Buzzard's Bay, and of very little value for cultivation. Native pitch pine seed was sown broadcast on the surface in the spring, and has done well, though lately afflicted with a sort of blight. Scotch pines did well also; their value as timber is doubtful, but they are good for fuel. He sowed 100 acres. By sowing broadcast, the trees came up too thick. Hundreds of loads for fuel have been cut out without being missed.

Some Cape Cod farmers cut a place in the sod with a hoe and drop a seed or two. Others run a light furrow six or seven feet apart and drop the seed the same distance, covering lightly. This saves seed; besides you know where the seed was dropped and can supply deficiencies. American red pine (*Pinus resinosa*) is recommended for the coast, but its seed is scarce. It is the Norway Pine of New Hampshire. It is a very fine and valuable variety, with wood something like southern hard pine. Planting chestnuts and walnuts on rocky soil is recommended. Many other varieties, covering a large surface, have been planted with success—Scotch or European larch, Scotch birch, English sycamore, Norway spruce and willow and white ash. Sowing pine seed after a light snow in March and April is a good time; the seed then can be put on uniformly.

According to Ben Perley Poore, chestnuts are perhaps the most profitable forest tree that can be planted. The oak is of such slow growth that two or three generations pass away before it can be remunerative. Chestnuts, on the contrary, soon bear nuts, which are a source of profit if sold, and of great delight to the young people if they are permitted to gather them. In twenty-five or thirty years, trees are sizable for timber or for fuel. In the interior of Pennsylvania extensive tracts are devoted to the growth of chestnut timber, which is cut off at intervals of sixteen years and converted into charcoal for the use of ironworks. New trees spring up from the stumpage and, if carefully thinned out, make rapid growth.

Mr. J. W. Manning, of Reading, gathered the newly-ripened seeds of the maple late in June, sowed them at once, and in fourteen months had seedlings seven inches high. The white pine drops its cone for seed once in four years.

A SPIRITED VILLAGE.

The little city of Malden, Mass., has an "Improvement Association," composed of some of its leading citizens, which might be copied to advantage by villages all over the land. The scope of this association is thus expressed: "The object of this association is to awaken and encourage in the community a sentiment and a spirit which will act for the common interest; to create or stimulate in the individual a regard for the elevation and improvement of the community, thereby securing better hygienic conditions in our homes and surroundings; an improvement of our streets, sidewalks and public grounds; a protection of natural scenery, and the building up and beautifying the whole town, and so enhancing the value of its property and rendering it a still more inviting place of residence." The association offers encouragement for the planting of trees along streets, by offering to plant any tree which may be furnished, providing the citizen furnishes half the loam required; or it offers to pay 2 dols. "to any citizen for each tree of a proper size, symmetrical and of good quality and suitable variety." The kinds recommended for general planting are elms, rock maples, and Norway maples.

CANADIAN CO-OPERATORS.

Miss Annie L. Jack insists, in the *Rural Canadian*, that children should be taught to love and grow trees, after all the most hopeful future aid of forestry, and most likely to give strength to the recommendations of Mr. Phipps in his official report on Ontario Forestry, that what remains of the original woodlands, even though only ten to forty acres, in different farmers' clearings, should be carefully preserved. Country school teachers have had the bright example of Miss Nye, of Michigan, prominently placed before them by western editors. Despite the official "No" from trustees to fence in and ornament the school grounds, this lady's individual handling of the spade indoctrinated, in a year's time, first the children and afterwards the whole community, into enthusiastic plant-growing.

PLANT GROVES.

The farmers of Iowa who wished to be at New Orleans during the cold weeks of January last, are reminded by the local organ that the best way to shut out the cold is by a dense grove. Now that grass is to be the prevalent crop, every consideration of profit and ornament, utility and mercy, requires the cultivation of groves.

"One of the greatest mistakes we have made in our farming operations is the failure to set out groves the first year. And they ought to be not merely a row or two of trees, but such a combination as to make an effective blizzard-barrier. Outside we should have planted Lombardy poplars—as worthless a tree as ever grew—but it has this merit, it will grow rapidly and will bear crowding. Next would come cottonwood, maple, or anything that would stand crowding. Next, valuable timber, such as ash, catalpa or walnut for the main grove, and then, to make it perfect, a row or two of Scotch or Austrian pines. Let a farmer get all these between the north and west winds and his house and stock, and a few rows of valuable timber between him and the south wind, and he can laugh at 20° below zero, with the wind thirty miles an hour."

CONIFERS WHICH GROW ON THE PRAIRIES.

Professor Budd notes, in the *Prairie Farmer*, that *Picea pungens*, *Abies picta*, and *Picea alba*, the silver spruce, Siberian fir, and American white spruce, grow well in Iowa. The latter has been tried here and there over the whole north-west, even up to Bismark, Dakota, and pronounced one of the finest district trees for lawns, parks, and streets, as also for prairie wind breaks.

SYLVICULTURE BY CONTRACT.

The *Philadelphia Press*, when referring to Government forestal undertakings in South Australia, says:—"One and one-third million of trees are a good many, and all these planted in eight years! But we know of one firm that has planted during five years 2,720,000 timber trees in a single county of Kansas, aside from the millions they have grown and sold elsewhere.

"It may be added that not only did this single firm furnish all these trees and take the contract to plant them, but agreed to care for them and deliver them over standing six feet high and four feet apart, established, shading the ground and able to take care of themselves. We are not doing as much work in sylviculture as our rapidly vanishing forests warn us that we should do, but we are doing a great deal, and doing it well. This plan of contracting to care for the young forest seedlings during their critical early years, and delivering them only when they have become lusty saplings, capable of maintaining themselves, is an American novelty. Persons desiring to make forest plantations on a large scale, can in this way insure themselves against loss by a guarantee that their young stock will have the most intelligent care when such care is most needed."

NATIVE EVERGREENS.

At a recent meeting of the Mississippi Valley Society, held in connection with the New Orleans Exhibition, the growing of evergreens indigenous to America for wind-breaks around the prairie dwellings was insisted on. L. B. Pierce, in passing from Ohio to Kansas City, did not see a single home provided with any artificial or complete protection from the prevailing winds. Yet the Kansas farmer uses corn to feed his kitchen stove; for as it is there so cheap that it will not buy its equivalent in coal, he is justified in so using it. Over the West, thousands of bushels are being consumed for the production of heat. The actual expense to the city of New Orleans by a cold northern wind lasting but a short time must amount in the aggregate to a very large sum of money, much of which would be saved by the planting of wind-breaks on the prairie. Beyond Kansas City, in Kansas and Nebraska, wind-breaks are quite common, but they are all of deciduous trees. Now the evergreens are nature's beautiful winter garments; and the winter protection afforded by the two kinds may be compared to that given by gauze and flannel. Then why this extensive planting of foreign evergreens, when no country in the world possesses so many beautiful indigenous ones as the United States. Thus the red pine of Northern Michigan is for the first twenty years at least the most beautiful of American pines, and deserves a trial in the Western States.

President Parker Earle would rather lose his apple-trees than his evergreens. In fitting up a home, he would plant ornamental trees first and fruit afterward.

Mr. Cassel, of Mississippi, said that the holly, as found growing wild, was thin-foliaged and not very attractive, the berries being found on the tops of the older and taller trees. It was difficult to transplant from the forest, which was one reason that it was not more generally used for ornament in Mississippi. Grown in the nursery from seed, on very rich ground, and shortened in with the pruning-knife, it made a compact and beautiful growth. Like other evergreens, frequent transplanting when young multiplied their chances for doing well when finally removed to ornamental grounds.

Mr. Jessup, of California, said that each region had native trees and shrubs that were exactly adapted to it. Such trees were cheaper, easier to be obtained, and in many cases more desirable than high-priced exotics.

Vice-President Munson said that he would not fence a place either with boards or evergreens, so as to exclude the public from enjoying its beauties. In planting for landscape effect, knowledge of the hardiness and probable size of a tree was necessary. In Northern Texas, the golden arbor vitæ was one of the most beautiful of the smaller evergreens. The wild evergreen peach was a tree peculiar to Texas, of great beauty, and easily grown. The chaparral, an evergreen native to Texas and New Mexico, was highly ornamental when cultivated. It had greyish leaves, with thorns upon the edges. It was the *Berberris trifolius.*

Mr. Wright, of Iowa, said that the subject of home ornamentation was not only neglected by farmers, but by horticulturists as well. The old-fashioned Lombard poplar is not hardy in Northern Iowa. There are varieties that do succeed, however, and one that greatly resembles the old type, flourishes as far north as Minneapolis. The common berberry was a good hedge plant in Iowa. The subject of beautifying our home surroundings should be kept constantly before the people.

Mr. Ragan, of Missouri, wondered that the holly was not more generally grown by nurserymen. Mr. Francis of Missouri said that the difficulty of transplanting was the chief reason. Dr. Hape said that he pruned back severely, and removed the leaves when transplanting. Thus treated, it could be removed without difficulty. It would withstand 10° or 12° below zero, if the ground around the roots was protected from prolonged and severe freezing.

THE BEST AND MOST ECONOMICAL SYSTEM FOR THE AFFORESTATION OF WASTE AND OTHERWISE UNPROFITABLE LANDS IN THE UNITED KINGDOM.

By WILLIAM MACINTOSH, Assistant Forester, Lovat Estates Office, Beauly, N.B. Being the First Prize Essay awarded by the Scottish Seed and Nursery Trade Association, Session 1884.

PART I.

IN the present depressed state of agriculture, it is obvious to all, especially so to landed proprietors, that the value of land is deteriorating, and the annual income derived therefrom becoming sadly reduced. The cry of the tenant-farmer is for a reduction of rent, which in many cases we have no doubt is required, as otherwise the farms may become tenantless, but the proprietor must sadly suffer. What is to be done? how is the loss to be retrieved? The prospects of the present are dark; but is there not a ray of hope for the future in the heading of this paper? Is it not suggestive of a sound investment and a profitable utilization of the soil that now lies comparatively waste, or at most realizing only a few shillings per acre? There are millions of acres of such land in this country that might be made to yield an annual rental of from fifteen to thirty shillings per acre by judicious afforesting.

The notes of alarm which issue from time to time from home and foreign magazines and papers regarding the probable timber famine at no distant period, have attracted the attention of political economists and statesmen to the subject of afforestation of our waste lands.

The forests of America, which at one time seemed inexhaustible, are fast disappearing before destructive fires, and the legitimate requirements of an increasing population dispersed throughout the treeless prairies, and their total extinction, cannot be long delayed unless better methods are adopted for their protection and reproduction. Far-seeing men in the United States and Canada apprehend a period not very distant when the home demand will absorb the growth of the forests, at least of the higher class of timber, such as the White Pine (recognised as the Yellow Pine of commerce).

As bearing upon this question, we quote the following statement made by Professor C. S. Sargent, Special Agent in charge of Forestry Statistics of the United States Census two years ago:—

"The entire supply (White Pine) growing in the United States and ready for the axe, does not to-day greatly, if at all, exceed

80,000,000,000 feet, and this estimate includes the small and inferior trees, which a few years ago would not have been considered worth counting. The annual production of this lumber is not far from 10,000,000,000 feet, and the demand is constantly and rapidly increasing.

"The publication of these facts a few months ago has greatly increased, and in many cases more than doubled, the value of Pine lands; and it does not require any particular powers of foresight to be able to predict that the price must advance to still higher figures. Enough is now known to permit the positive statement that no great unexplored body of this Pine remains; and that with the exception of the narrow redwood belt of the California coast, no North American forest can yield in quantity any substitute for it."

Hence the importance of developing and extending our home forests in anticipation of a probable timber famine. If America cease to export, where is Britain to import its timber, annually valued at from eighteen to twenty millions sterling, from? Why in the face of this should the millions of acres of suitable planting ground in Britain lie waste?

The home timber trade in recent years has been much depressed, and proprietors have found a difficulty in getting market for forest produce, especially the smaller-sized timber, that in a proper system of forest management must be periodically removed, and this is likely to continue until a return of general commercial prosperity. Hitherto the system of forestry in our country was to cut down saplings as soon as saleable for a very nominal price, which has ruined many valuable wooded properties. That system is now likely to be reversed, as it is recognised as a matter of private as well as public interest, that the future system of forest management will be the production of mature timber suitable for constructive purposes, which, in the face of what we have already stated, will meet with a ready market a few years hence.

Many entailed properties now richly wooded have been afforested by borrowing under the "Enclosure Commissioners' Act," thereby enhancing the value of the land without incurring an outlay which demanded immediate payment. And the proprietor who holds his lands in "fee simple" could not invest in a safer and more profitable investment than that of judicious planting. The most economic and best way to do this forms the subject of this paper, which we propose to treat under four heads, viz.:—

I. The selection of a district suitable for afforesting.
II. Properly enclosing the land.
III. Drainage, and the formation of roads.
IV. The selection of plants and planting.

I.—*The Selection of a District suitable for Afforesting.*

A great extent of the waste lands of the kingdom are from elevation, exposure, and soil useless for tree-growing. The high barren mountains of Scotland, the peat bogs of Ireland, and what is waste of the ocean-lashed Hebrides, may be mentioned as land of this kind. Heavy, low-lying wet lands, or cold mossy soils in elevated and exposed situations, should be avoided. Not but that even these subjects might be improved by planting, but the results obtained would not be commensurate to the expenditure incurred in preparing the soil by drainage, etc. The great central and eastern plains of England, York, and Cheshire, together with the tablelands of the North of England and the South of Scotland, are well suited for growing trees of the hard-wooded sort. But for afforesting on a large scale, the hillsides of Scotland north of the Firths of Forth and Clyde, and that of the north, west, and south of Ireland, are the best suited subjects. In no department of his work is the judgment of the planter more required than in the selection of sites that will meet the requirements of our most profitable timber trees.

II.—*Property enclosing the Land embraces as a matter of course the Selection of a Line of Fence.*

The future welfare of a plantation is considerably affected by the way in which the boundary-line is drawn, especially so on exposed lands.

In laying out the boundary-line, the planter should first of all acquaint himself with the physical geography of the district, and ascertain the points from which the cold and most destructive winds blow. He then should lay the widest side of the enclosure (if the site admits of that) in face of the prevailing wind, giving the boundary-line on that side a bold convex form. Straight lines should be avoided on exposed parts, as the storms strike upon them with unbroken force; but a line bent boldly outwards, as recommended above, weakens the force of the wind by dividing it (if we may use the term) and driving it to right and left. And if it be found unavoidable to have a bend with the concavity to the storm, it should be made, if possible at all, in a hollow between two hills where the line on either side projects well out.

There are now so many methods of enclosing plantations, that it would occupy too much of our space to describe them all. We will therefore confine ourselves to those we consider the most economical and serviceable. If shelter for young plants be an object, as is almost always the case on exposed lands, we would unhesitatingly, if stones are to be had on the ground or at a reasonable distance, recommend in preference to any other a dry stone dyke with three tiers on top. Although such an enclosure is expensive at the outset, it is cheaper in the long-run than any other, when we take into consideration its durability, the efficiency against sheep, and shelter it affords, on exposed ground especially, to the young trees. Stone dykes are built of various heights, but we consider three-and-a-half feet high, including copestone, with three wires on top, quite sufficient for a plantation fence (see Fig. 1). It should have a firm foundation, with a width of about 34 inches, leaving 4 inches of a scarcement (see Fig. 2, end section), and be built up with a regular batter having a row of through bands, and a width of about fifteen inches at bed of cope, which should be well bedded in lime and also pointed. The standards for wires should be set 14 yards apart, firmly batted into the through-band stones, which should be 1 foot below bed of cope. Straining pillars should be set about 160 yards apart, and iron droppers firmly wedged to wires in every 6 feet.

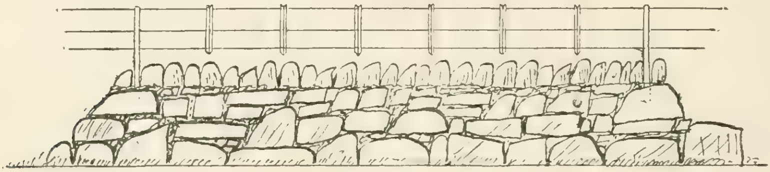


FIG. 1.

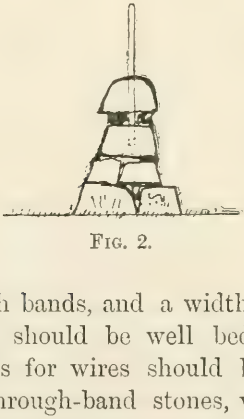


FIG. 2.

The cost of erecting a fence of the above description entirely depends upon the price of labour in the neighbourhood and the cost of getting stones. Taking labour and cartage at an average rate, and including all outlays in connection with such a fence, it should be completed in a workmanlike manner for 1s. 9d. per lineal yard.

In high-lying parts of the country, where shelter is necessary and stones are not to be got, a turf dyke with three wires on top is, in our opinion, next to a dry stone one. There are two kinds of turf dykes, " double and single." The former is suited better for level ground, but along the slope of a hill the single suits best (see Fig. 3).

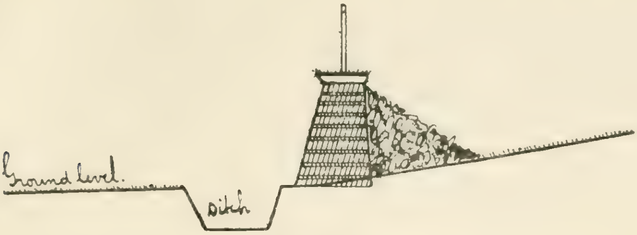


FIG. 3.

In front of the single dyke there is a ditch generally made 6 feet wide at top, 3 feet wide at base, and $2\frac{1}{2}$ feet deep, the excavated earth being thrown at the back and sloped up where it is firmly bishoped, which strengthens it as a fence considerably. The height of the dyke from the bottom of the ditch is 5 feet, and the foundation should be about 24 inches wide, and the cope or topmost turf 15 inches wide, which should be laid green side up, all the other turfs with the green side down.

The foundation of the double dyke requires to be wider than the single one, as there is no back support. A width of about 3 feet will be found sufficient for a dyke 4 feet in height, and the coping 18 inches wide. A dyke of the above dimensions, when made, will in a few months settle down into one of $3\frac{1}{2}$ feet or so. The posts for the wires, whether of wood or iron, should in all cases be put into the dyke while it is being made, and the wires attached to them afterwards. The cost of a double dyke (see Fig. 4), with three wires on top, is about 1s. per lineal yard, and single dyke with three wires is about 9d. per lineal yard.

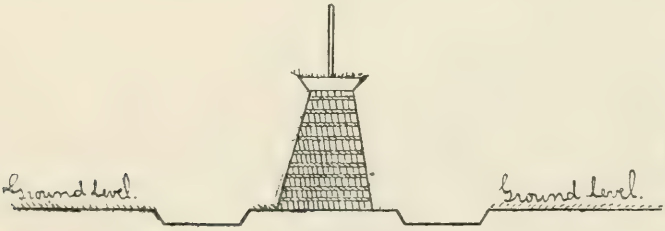


FIG. 4.

Where artificial shelter from fences is of no importance, the "Corriemony" wire fence could with advantage be used, as it is a cheap, durable, and substantial fence if properly erected.

The height should be about $3\frac{1}{2}$ feet, which would be found sufficient for keeping out sheep and cattle. It should consist of one wire of No. 6 Galvanized 7-ply strand on the top, and six wires of No. 8 Bessemer steel wire below. Standards of T iron (furnished with side stays) for fixing into stone laid 14 yards apart, should be erected along the line of fence, and straining pillars 160 yards apart, and droppers at 6 feet apart, should occupy the spaces between (see Fig. 5). The material should be the best procurable. In laying out the line of fence, the superintendent should bear in mind the advantage of having standards in all the hollow and high parts, thereby saving the additional expense of filling up the gaps in the former, and levelling down the latter, which would be necessary were the standards placed indiscriminately. In the event of the fence running along a public highway, it would help greatly to secure it against any extra pressure or damage (to which it would not be so much exposed in any other place) to have a ditch in front about 4 feet wide at top, 1½ foot at base, and 1½ foot deep, the turf

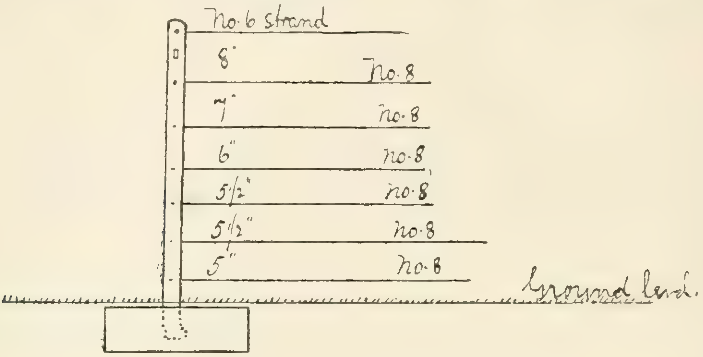


FIG. 5.

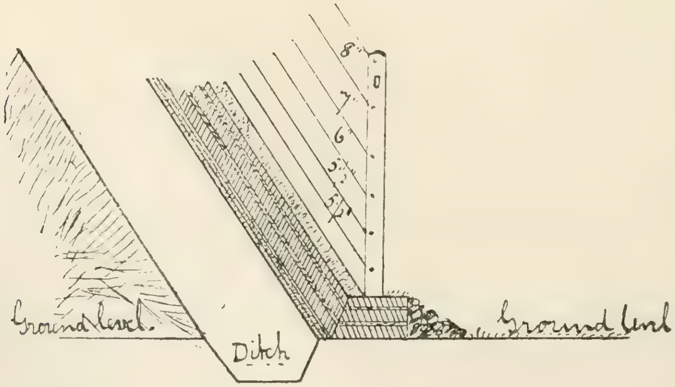


FIG. 6.

and excavated earth forming a bank which would constitute part of the fence. If this is done, the lowest wire could be dispensed with, six wires being sufficient (see Fig. 6). The cost of the fence without ditch, including all outlays, with ordinary cartage, would be about 1s. per lineal yard; including ditch, and dispensing with the lower wire, would cost about 1s. 2d. per lineal yard. The weight of material for each mile of this fence is about 2½ tons.

Having said so much regarding what we consider the most economic and substantial enclosures for plantations, we would, before leaving this part of our subject, impress upon those who are about to enter upon such an undertaking, the importance of having such enclosures erected in the most workmanlike manner, of the very best material; for if the work should be carelessly executed, there is endless outlay attached to it, and the enclosed trees are never secure from the inroads of sheep and cattle. Having the land well fenced, the next important step in order to fit it for the reception of the young plants is drainage.

III.—*Drainage and the Formation of Roads.*

It is found quite unnecessary in almost all large enclosures to drain all the land, and in many cases very little of it requires draining; nevertheless, the draining of wet spots, however small, should by no means be neglected, as there is no preparation of the soil of so much advantage to the healthy growth of young trees. Many of the failures in our young plantations are attributable to the want of proper drainage. Any person of experience can easily mark out those parts that require to be drained, by the general appearance of the land and the plants that naturally grow upon it. The dimensions of the drains require to be regulated by the nature of the land. Where it is very wet, they require to be deeper and closer set to one another. On not over wet land a distance of 15 to 20 yards apart would suffice. Main drains should be about 2½ feet deep, 30 inches wide at top, and 10 inches at base, and tributaries from 18 to 20 inches deep. Where moorband pan is in course of formation, the land should be drained two years before planting, so that the soil may be freed from stagnant water, and made porous to the admission of air and rain-water, both of which are powerful agents in assisting to break it up and check its formation. Stagnant water, in conjunction with the iron in the soil, is the chief agent in the formation of pan.

It should be always observed that where the soil is of a clayey or peaty nature, drains should be deeper and closer set than on open light soils. Great personal discrimination should be used in laying out drains, as no rule by which to go can be set down. The arrangements which suit one piece of land would be entirely useless for another. The drain which draws the water out of the soil most effectually is the best laid out, whatever be the angle at which it is laid.

The cost of making such drains, as specified above, depends entirely on the soil; but on average soils, main drains of the above dimensions should be made for about 3s. per chain, and the tributaries about 1s. 3d. per chain.

Roads.

In all large plantations there should be tracts left unplanted in the form of roads. There should be one or more main roads, as the case may require, formed, running through the ground, and the other open tracts leading into it at no greater distance than 400 yards. It is unnecessary to incur the expense of forming the smaller roads at this early stage, as they would not be required for the removal of forest produce for fourteen or sixteen years afterwards. Only let side drains be made where the ground is very wet.

The necessity of judiciously laid-out roads is obvious to every one interested in the management of woods. The expense which is incurred in carrying the thinnings from the interior of a plantation to where they can be taken away by carts is greatly lessened by well laid-out roads. These roadways are of great service to sportsmen as well as timber carriers.

It has been argued that it is uneconomical to allow land to be occupied by roads until they are required for the removal of thinnings. Apart from what we have already stated regarding the advantage derived from these openings, the cost would be considerably greater to form firm roads equal to those we would have by making side drains where necessary, and leaving the spaces unplanted. One great advantage in laying off the lines of roads before planting is, that the contour of the ground can be seen, and the roads carried on convenient lines in the hard and firm ground. If the roadways were planted, all the stools of the trees would require to be rooted up before carting began, which is no small labour, and would cost as much as the trees on the tract at the time of the first thinning would be worth, and the soil would be so loose and open by the roots of the trees that grew on it, that it would take a considerable time before a firm surface could be had that would stand any ordinary traffic. The cost of the formation of such roads depends entirely on the nature of the ground, but in taking an average, the main roads should be formed for about 8d. or 1s. per lineal yard.

(*To be continued.*)

THE CONQUERING OAK.

BY ROBERT DOUGLASS.

SIR JAMES CAMPBELL'S exhibit at Edinburgh was most interesting in proving to the public what both English and American foresters and tree-growers know from experience to be a fact, viz., that the tap-root of the oak is a temporary matter, and that if it is transplanted after having the tap-root shortened it will form a perfect root sooner than the seedling, and outstrip it in rapidity of growth and symmetry of form. We have millions of such "Acorn Patches" in this country, and, aside from the trees blown down and uprooted in the forests (not only of one species thirty years old, but of numerous species of every age up to a century or so), we have seen stumps and trees dug out by hundreds to make room for roads, buildings, and other improvements, from all of which it is plain not only that the tap-root serves a temporary purpose, but that the longer the tree has depended on the tap-root the more inferior and misshapen it is, and that a well-balanced tree has a well-balanced root. If it were not aside from my present purpose, I might show that the burr oak depends longer upon its tap-root than does the red oak, and that the species vary greatly in this particular. There are many other equally interesting facts connected with this root, but I wish now to call attention to the advantage which it gives the young oak in its struggle for existence in its native woods. Indeed it is the principal advantage which makes the progress of the oak resistless, enabling it to hold every foot of ground it gains, and crowd its way by approaches slow, but so certainly triumphant in the end, that I believe it only needs a foothold in a continent with soil and climate suited to its growth to conquer and possess the whole.

This aggressive vigour of the oak is more remarkable when we consider that the ash and maple produce 20 times as many seeds, the elms 100 times as many, the conifers 500 to 1000 times as many seeds as do the oak, tree for tree, and in all the kinds named the acorn is the only seed that has not a wing or some provision for distributing it to a distance from the tree. The only apparent way that acorns are carried to a distance from the tree is by squirrels and other animals. Blue jays fly off with them and drop them while fighting in the air. I have seen an acorn sprouting through the crop of a passenger pigeon that had probably been killed by a hawk. But, after all, only a few acorns are carried to a distance compared with the quantities of the other tree seeds named that are blown abroad by the winds. Yet, where an acorn is dropped on the ground it is almost sure to grow. The seeds of the other kinds are like those "dropped in thorny places where the thorns spring up and choke them." Not so with the acorn. Its strong radicle will drill its way down into the ground through the vegetation and between the interlacing roots of other trees near the surface, extending its tap-root over a foot in depth when its stem is not two inches above ground. There it will "bide its time," year after year, often in dense shade, going on slowly but surely until it has killed out a space about it, and then it will force out side roots to feed on the decayed vegetation and decayed roots in the vicinity. Should cattle or deer tramp it down, it will throw a stronger shoot from the collar. Should a fire sweep through the forest, unless it burns into the ground below this collar, the oak will throw up a stronger shoot than ever. Now it has the strongest start of any tree in the new growth. It is no longer in the shade. Side roots are now thrown out and meet with little opposition, and the tap-root, having served its purpose, dwindles away.

Darwin said long ago that the oak was driving the pine to the sands. They are driving other trees as well whenever they have an even chance. They are creeping out into the prairies and covering unoccupied grounds in the West wherever it is not too wet or too sandy for them to grow. Thousands of acres are now covered with young oaks where they did not grow forty years ago. I can call tracts to mind now that forty years ago were too moist for oaks, but, having gradually become drier, are now clothed with these trees that have crept in inch by inch. Facts like these have induced us to discontinue the growing of oak seedlings for sale. We believe that oak timber will be plentiful when other kinds are scarce.—*Philadelphia Press.*

WAUKEGAN, ILL.

NOTES ON BRITISH ORCHIDS.

BY A. D. WEBSTER.

No. I.

THERE are few plants that have received less attention, and about which greater ignorance prevails, than our native orchids. This is all the more to be wondered at when we consider the beauty and mimicry of flowers displayed by many of the species, as well as the ease with which, as garden plants, the majority may be cultivated. With most persons the name orchid is only associated with the heat and luxuriant growth of tropical climes, and our few native representatives of this great family are known only to botanists, and by them understood but very imperfectly. True it is that the majority of our native species have but little claim to distinction, for the modest beauty of their flowers, although exquisite in its way, can hardly bear comparison with the gay colours of the epithytal members of the family, so that the preference shown for these latter is but natural, and scarcely to be wondered at.

The peculiar construction and mimicry of the flowers of our native orchids, combined with their delicate colouring and rare local distribution, should, however, all serve to render these plants favourites and of particular interest to the cultivator of British plants. When we consider the dependency of these plants (all our native species, with perhaps one exception) on insects, that the gay colourings, peculiar structure, and even odour, offensive though it be in some cases, are not mere adornments but of the greatest use in the fertility of these plants and the perpetuation of its race, we cannot but be struck with both admiration and surprise—indeed, the modest confession of the late Charles Darwin, after twenty years' study, that he doubted if he thoroughly understood the contrivances in any one flower, alone shows us how worthy of the most minute and careful examination this family is.

Before entering into a description of the individual species, it may here be well to give a brief outline of the various parts of an orchid, which will apply to the British species generally. These are terrestrial herbs with tuberous or fascicled roots, and sheathing radical or sessile cauline leaves. The flowers are solitary, spicate, racemose or paniculate, and each furnished with a bract that springs from the point where the flower stem joins the main stem. Perianth coloured and composed of six irregular segments — three inner divisions (petals) and three outer divisions (sepals). The three outer are similar, and also the two lateral inner, whilst the lower inner segment, which is called the *labellum* or lip, differs considerably, and is usually beautifully or grotesquely shaped, and often spurred at the base. Although usually pendent (this being the case in all our native species, with few exceptions), the labellum is properly speaking the upper petal; but a slight twist in the ovary has turned the flower upside down, thus enabling insects to enter the flower more readily. Darwin, in his delightful book the *Fertilization of Orchids*, tells us that "in most flowers the stamens, or male organs, surround in a ring the one or more female organs called the pistils. In all common orchids there is only one well-developed stamen which is confluent with the pistils, and they form together the *column*.

Ordinary stamens consist of a filament, or supporting thread (rarely seen in British orchids), which carries the anther; and within the anther lies the pollen or male vivifying element. The anther is divided into two cells, which are very distinct in most orchids, so much so as to appear in some species like two separate anthers. The pollen in all common plants consists of fine granular powder; but in most orchids the grains cohere in masses, which are often supported by a very curious appendage called the *caudicle.* Orchids properly have three pistils or female organs, united together, the upper and anterior surfaces of two of which form the two stigmas. But the two are often completely confluent so as to appear as one. The stigma is penetrated in the act of fertilization by long tubes, emitted by the pollen grains, which carry the contents of the grains down to the ovules or young seeds in the ovarium. The upper stigma is modified into an extraordinary organ called the *rostellum,* which in many orchids presents no resemblance to a true stigma. When mature, it either includes or is altogether formed of viscid matter."

The ovary or seed vessel is a one-celled three-valved inferior twisted capsule, containing numerous very minute seeds, appearing like fine sawdust, attached to the valves.

British orchids have been divided into sixteen genera, and these again sub-divided into about forty species, of which the following is a brief description, the result of several years' close personal observation:—

Genus 1.—*Orchis.*—Sepals and petals nearly equal, arching over the column. Lip turned downwards, spurred on the under side at the base and lobed or crenated. Anther with two erect cells, on the face of the column, converging together at the base, with an erect process, each cell containing a pollen mass, contracted below into a short stalk, terminating in a gland or viscid disc. Root a fleshy tuber either entire or palmate. Stem leafy, with a terminal spike of flowers.

Included in this genus there are a dozen species—O. mascula, O. maculata, O. latifolia, O. morio, O. pyramidalis, O. fusca, O. militaris, O. ustulata, O. laxiflora, O. intacta, O. hircina, and O. conopsea.

Orchis mascula (the early purple orchis).—Tuber entire, oval, and in full-grown specimens about the size of an ordinary filbert. Leaves broad, elliptic-lanceolate, with longitudinal parallel veins of a smooth, shining green above, paler underneath, and usually spotted. Flowers purplish-crimson, but subject to great variation, the disc of the lip alone being white and spotted, with a downy surface. Lip three-lobed, the middle one cleft, and reflexed on the sides.

Although one of the commonest, this is perhaps the most ornamental of our native orchids. It is to be found growing in almost every conceivable soil and situation—from dry, arid ground to that saturated with constant, though not stagnant, moisture, and from sea-level up to, in this district, 700 feet—though, like other species of the orchis tribe, it undoubtedly prefers and attains greatest perfection in certain classes of soils and in moderately sheltered situations. The largest and finest specimens of this orchid I have seen were growing in good, strong, rather damp loam, with a southern or eastern exposure, but this latter is not of special importance where partial shade is secured. The colouring in the leaves of this orchid varies very much, three distinct kinds being generally recognised—(1) perfectly green; (2) thickly marked with small purple spots; (3) heavily blotched with purple. This variation of leaf has been attributed to several causes, notably the presence of lime or potash in the soil, but careful observations and experiments in this way have now fully convinced me that such is not the case. The colour of the flower is not in the least affected by this variation, and is of all shades, from a rich, deep purple to nearly white: the latter colour is, however, rare, and probably due to some constitutional defect of the plant; indeed, I have never noticed a white-flowered specimen of this orchid with such healthy foliage, nor attaining to so large a size as the normal form. The flower is remarkably variable as regards odour, being at one time faintly fragrant, while at another it is so offensive as to be unbearable in a room. The root of this orchid, if examined during the growing season, is found to consist of two oval tubers, one of which is destined to be the successor of the other. The newly-formed tuber may be readily detected by its plump, vigorous appearance and light colour, the one supporting the present plant being wrinkled and withered and of a dull brown or tawny colour. It is usually found embedded in the soil at a depth of from 3 to 4 inches, and when starting into growth sends out from the top or bud end a few thick, fleshy fibres, which spread in an almost horizontal direction for about 3 inches.

The tuberous roots of this, as well as several others of our native orchids, abound in glutinous matter which is perfectly wholesome and very nutritious, making the salep of the Turks. I have frequently met with this orchid 20 inches in height, and with a flower spike, when fully expanded, 6 inches in length. This is, however, exceptional, the average size, under ordinary circumstances, seldom exceeding 15 inches. The reproduction of this orchid is a rather slow process, for on examining the roots of several hundred specimens it was rarely that more than one new tuber was present at each, which naturally leads us to believe that it is propagated in greatest quantity from seed. These also require several years to produce flowering plants, the exact number I have, however, not yet been able to determine by actual experiment. At an early date I hope to be able to speak on this subject with a greater amount of certainty.

On low rock-work amongst Alpine plants, or even in the open border, few spring-flowering bulbs can equal this orchid when well grown, either for beauty of foliage and flowers or lasting qualities;

and coming into flower at a time when but most other plants have started to grow, makes it doubly welcome. The beauty of this, as well as all our native orchids, is much enhanced by planting in clumps or masses of, say, from a dozen to twenty in each, with just sufficient room for the foliage to become perfectly developed, single specimens of any kind giving but a poor idea of what the plants appear when thoroughly established in good, bold masses.

O. maculata (spotted orchis).—Tubers palmate, spreading and usually rather flat. Leaves lanceolate and marked with dark purple blotches of irregular size, although green-leaved specimens are by no means uncommon. The colour of flowers, though usually pale purple or lilac, is subject to great variation. Spike short, dense, and conical. Lip irregularly three-lobed, and crenate.

The bold, majestic appearance, beauty of both foliage and flowers, and strong, hardy nature all combine to render this plant one of, if not the finest, of our native species. When well grown in good, damp loam, this orchid attains an average height of from 2 to 3 feet, and presents a very different appearance to what it is usually seen in poor, half-starved soils, and high-lying situations. The finest and most luxuriant patches of this orchid I have seen were growing in strong, brown, rather damp loam along the outskirts of a woodland having a northern aspect. The ground was thickly covered with grass, brambles, and bracken, and one of the patches contained considerably over one hundred specimens, the average size of which was from 2 to 3 feet, but one gigantic plant measured exactly 3 feet 9 inches in height, and bore a most magnificent spike of flowers. The leaves of this orchid are of a pale green above, covered with numerous reddish-brown oval spots or irregularly-shaped blotches, and frequently, though not always, overlaid with a silvery-grey cuticle. Underneath, the leaves are often covered with the same silvery cuticle; but this, I have noticed, is usually wanting when the plant is growing in exposed or high-lying situations, and most noticeable in low-lying, damp ground, and where the plants are shaded from direct sunshine. The lower leaf or leaves are always rounded at the tips, but farther up they become longer and decidedly narrow lanceolate. Green-leaved or unspotted forms are by no means uncommon; indeed, in this district the proportion of these to that of the typical plant is as three to seven. This variation in the colour of the leaves of *O. maculata* is by no means easy to account for, and has certainly baffled all my researches to satisfactorily explain. When the reason seems almost conclusive, something crops up to leave us farther from the mark than when we started, and I fear we must say with Bishop Hall . . . "neither is there any miraculous way but in an ordinary course of nature." Neither in this orchid nor

O. mascula can this variation of leaf be attributed to soil, altitude, or situation, as all these I have carefully studied in conjunction with the plants. In the large patch of *O. maculata* referred to above, nearly one-third of the plants were green-leaved, and grew indiscriminately amongst the others, so that in this case at least soil could hardly be considered as the cause of difference. The production of seed in *O. maculata* is something amazing, one capsule alone after careful computation being estimated by Darwin to contain no less than 6200 seeds, most of which were good; and as there are often over 30 capsules on the same plant, the total number would be 186,300.

As showing the possible rate of increase of this orchid, and to give an idea what the above figures really mean, we will sum up in the words of Darwin: "An acre of land would hold 174,240 plants, each having a space of 6 inches square, and this would be just sufficient for their growth; so that, making the fair allowance of 400 bad seeds in each capsule, an acre would be thickly clothed by the progeny of a single plant.

"At the same rate of increase, the grandchildren would cover a space, slightly exceeding the island of Anglesey; and the great-grandchildren of a single plant would nearly (in the ratio of 47 to 50) clothe with one uniform green carpet the entire surface of the land throughout the globe."

When we consider, therefore, on the one hand, the great production of seed, and on the other, the comparative scarcity of the plant, we are naturally led to ask the question, What checks the unlimited multiplication of this orchid?—a question which has as yet never been satisfactorily answered. As an ornamental garden plant, *O. maculata* is very desirable, and when once thoroughly established, will increase in size and splendour from year to year. It may be planted in good, rich, rather damp loam, and when once thoroughly established, should be left alone, for, like most of the palmate tubered orchids, this plant is rather impatient of root disturbance.

A variety of the above, named *O. maculata superba*, was distributed by the late Miss Hope, of Wardie Lodge, Edinburgh, from which circumstance the plant is usually known as Miss Hope's orchid. It is a very handsome variety, of a strong, sturdy nature, with stiff, almost erect leaves thickly covered with small purple spots. The history of this plant I do not know, but if I remember rightly, the Rev. C. Wolly Dod told me that it was found or rather detected in a cottage garden at Kilmarnock, by Miss Hope, and whose name it still bears. I have grown and flowered this plant very successfully from tubers kindly sent me by the late Rev. H. Harpur Crewe, and which, I believe, he said were originally given him by Miss Hope. On several occasions I have found plants in the bogs of Carnarvonshire, that I consider equally as good as the variety just referred to; indeed, on growing the two plants side by side, I, as well as many others, found it impossible to detect a difference.

The habit and general appearance, as well as situations in which this plant is found growing, go far in establishing what I have on various occasions pointed out, viz. that this variety is far more closely allied to the marsh orchis (*O. latifolia*) than to its namesake *O. maculata.* That it is a sport or hybrid between these two plants is admitted by all—on the one hand, closely resembling *O. maculata* in flowers and makings of the leaf, and *O. latifolia* in habit, general appearance, and situations in which it is found growing.

With me Miss Hope's plant never exceeded 12 inches in height, the flower-spike alone being from 4 to 5 inches, very dense, and perfectly cylindrical.

O. latifolia (the marsh orchis).—Tubers irregularly and imperfectly palmate, resembling to some extent those of *O. maculata*, though usually smaller and not so much divided. Stem from 9 to 12 or more inches in height, with usually erect leaves of a bright green which diminish in size from the base upwards. Bracts, especially the lower ones, much longer than the flowers. Spur thick, conical, and shorter than the ovary. Lip three-lobed, and deflexed at the sides.

This is a very handsome and rather variable plant, and, especially as regards identity and classification, has been the subject of more comment than any other native species. By some botanists this plant is considered but a variety of *O. maculata,* but that the typical species of each are quite distinct I have long ago been convinced, although at the same time it must be admitted that intermediate forms linking the two plants together do exist, and of which *O. maculata superba,* one of the handsomest, may be cited as an example. The true marsh orchid (described as *O. incarnata* by the older botanists) can, however, never be mistaken for *O. maculata,* as no two native species are more dissimilar, either in size, habit, general appearance, or colour of flowers. The leaves of the marsh orchid are never spotted like those of *O. maculata,* but of a bright pleasant green, always erect, and clasping the stem. There is also this marked difference between the two, that whereas *O. latifolia,* when coming into flower, appears bristly, from the bracts being longer than the flowers, *O. maculata* is perfectly smooth, the bract and germs being of equal length. The flowers are also cylindrical, and of a flesh or port-wine colour, whereas in *O. maculata* they are conical and pale-purple or lilac. In *O. maculata,* the lower leaf or leaves are rounded at the tips, and shorter than those farther up the stem; but in *O. latifolia* the reverse of this is the case, the lower leaves being longest and pointed. Of the intermediate forms between these plants, I have particularly noted the following:—1. That in which the habit of the plant remains unchanged, but the leaves are faintly spotted, and the flower of a paler and less desirable hue than the species. 2. *O. maculata superba*, which is usually more robust than the typical *O. latifolia*, and, although the general habit remains to a great extent unchanged, the leaves are distinctly marked with small purple spots, and the flower-spike larger, but wanting in the deep, rich colour that is so characteristic a feature of the normal form. 3. Larger than the latter with the leaves spotted or blotched, and only sub-erect, but far more so than in *O. maculata*, and, like that species, with a pyramidal head of flowers rather loosely placed on the stem. These three forms occur sparingly along with *O. latifolia* in wet, marshy ground, growing amongst rushes and other semi-aquatic herbage, but never, that I have seen, at a great elevation. In this county I have frequently met with the plants, sometimes in quantity, so that ample opportunities have been offered for studying them under different circumstances as regards soil and situation.

As a garden plant, *O. latifolia* is rather difficult to manage, for destruction or injury to the least rootlet may be relied upon as destruction to the plant as well—at least such is my experience. It is, however, a lovely plant, with a peculiar fresh green tint of foliage that is wanting in any other species. The flower is also beautiful in the extreme, and cannot but induce any one who has seen it in its native haunts to cultivate the plant.

O. pyramidalis (the pyramidal orchis).—Tubers oval or globose. Leaves of a bright, unspotted green, lanceolate, narrow, and acute. Flower-spike short, very dense, pyramidal, and of a rich rose or crimson colour. Spur slender and longer than the ovary. Lip divided into three equal-sized lobes.

Too much can hardly be said in favour of this plant, as for ease of culture, beauty of flowers, and lasting qualities when in a cut state, it is perhaps unsurpassed by any other. The flowers cut when just expanding and placed in water with a few pieces of charcoal, will create a feeling of both delight and surprise, as well by their rich crimson colour as by their lasting qualities, frequently remaining good in a cut state for more than a fortnight.

It is usually, though not always, confined to limestone districts, and seems partial to a fine red loamy soil such as is usually met with on dry banks or pastures. The whole plant seldom exceeds a foot in height, and has a peculiar silky or glossy appearance which is most noticeable when the flowers are becoming developed. Occasionally the flowers are scented, but, strange to say, this is not the case in all specimens.

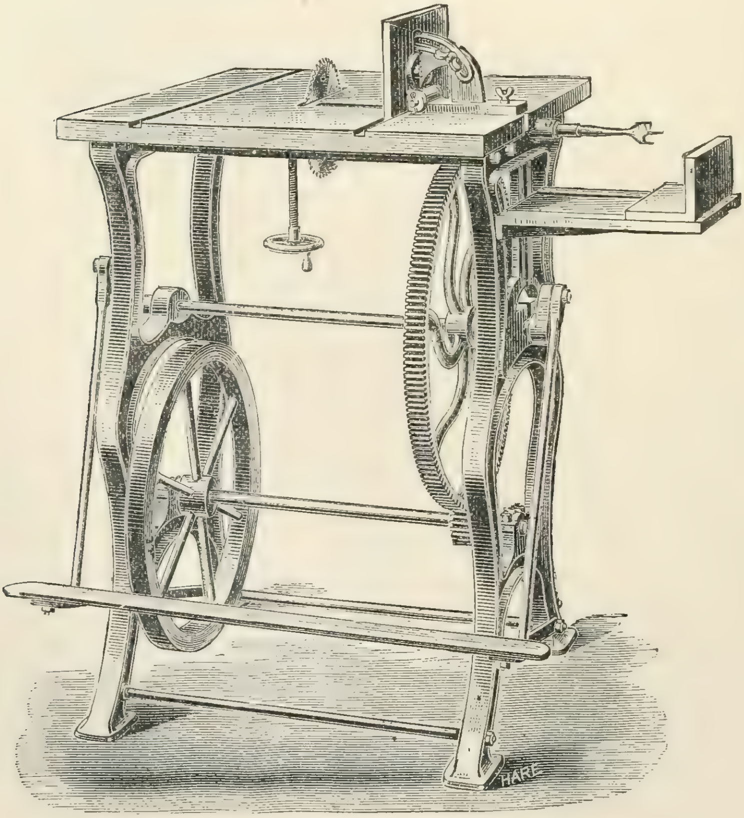
This is a very desirable garden plant, and may be easily grown in any open situation by adding a quantity of lime or chalk to the soil. Calcareous soil is, however, by no means necessary, as I have grown this orchid very successfully in pure red loam, similar to that in which it is found naturally.

Under cultivation it increases rapidly, and being a plant of great beauty is certainly well worthy of a place even in restricted collections. It flowers in June and July, the period being greatly extended according to soil, altitude, and situation.

FOREST AND WOOD WORKING MACHINERY.

NEW TREADLE SAW.

FEW modern mechanical inventions have wrought greater changes than the improved appliances for working wood; and we do not think it will be out of the pale of our sphere to illustrate from time to time some of these.



We give, on the opposite page, a woodcut of a new foot-power saw, patented this year by the Britannia Company of Colchester.

This machine has been invented, like all recently-brought-out saws, with a view to save labour; as it combines apparatus to do fret-cutting, grooving, dowelling, mitre-cutting, boring, and is provided with a circular saw capable of being driven at 1500 revolutions per minute, it must be deemed an economical piece of mechanism. The high rate of revolution is obtained by a connection which places the fly-wheel on a secondary spindle driven by the treadle-crank. Some idea of the power of this saw may be formed, that when worked by foot, a board of 1-inch mahogany was cut 3 feet 8 inches after the foot was taken from the treadle. A handle may be fixed on the left of the saw to give auxiliary force, or to be used instead of the treadle. The price of the bench with three saws is £15, and £1, 2s. 6d. is charged for the adjustable table at side.

The Britannia Company state that nearly double the amount of work can be done by this than any other saw of similar description.

AUSTRALASIAN NOTES.

A COMPANY has been formed at Echunga, in the Mount Barker district, Victoria, to cultivate wattles on 1900 acres of land which has been leased for twenty-one years. About 25,000 wattles have been trimmed to a height of from 5 to 6 feet in order to increase the value of the bark and to facilitate the work of stripping when the trees are matured. On the sites of burnt rubbish piles, young wattles are springing up very rapidly. Horses, which do not touch the trees in any stage of growth, are to pasture the grounds in place of sheep, which eat the young wattles. In those parts of the holding which it is proposed to cultivate from seeds and by transplantation, the trees will be put at distances of 5 feet in rows 7 feet apart. According to the *Melbourne Leader,* 17,000 lbs. (or about 7½ tons) of bark per acre are anticipated when the trees are five years old.

The same newspaper draws the attention of the Minister of Agriculture to the proposed destruction by the saw-mill owners of the timber country extending from Colac to the margin of the sea, including the Otway forest. According to a Mr. Costin, of Ballarat, there are there beech trees, "splendid-looking fellows," mountain ash trees "towering up 200 feet without a limb. Some specimens were discovered 70 feet, 80 feet, and 100 feet in circumference." There were also seen "samples of stringy bark, enough timber in any one of them to build a house and fence in a selection." He beheld for miles on every side the beautiful dark-green leaves of beech and blackwood trees, with their well-shaped umbrageous tops, with here and there a stately gum towering as monarchs above all. There has been a rush of selectors to the spot, who, except for Government interference, may soon make an end of all this.

In a lengthened description in the *Leader* of *petite* agriculture on the river Loddon, in which the trees chiefly grown are the almond, pear, plum, cherry, apricot, and grape, the preference is given to the first. The hedges of these almond trees yield nuts of the soft-shelled kind when about four years old. One shilling per tree per annum is estimated as a moderate minimum of their value; an excellent hedge is at the same time secured, which requires no cultural attention. The peach, on the other hand, does not do well.

It appears that apple-growing may soon be overdone in Victoria. In Gippsland and other districts, large areas have been planted within the last four years; and unless fruit-preserving come extensively into vogue, the supply will exceed the demand. The neighbouring colonies are much better adapted for growing the dearer marketable varieties. Thus Tasmanian growers now get 10s. the bushel for crabs, and much more for nonpareils; while Victorian orchardists have to sell the bulk of their produce at 4s. or 5s. per bushel, notwithstanding the protective duty of 1s. per bushel.

From the *Otago Witness*, we learn that blue gum was introduced into the colony by the late Mr. George Matthews more than thirty years ago, and planted somewhat extensively by Mr. Macandrew a few years later. There still exists a strong and unfounded prejudice against the eucalypts. An aphis similar to that which affects cabbage and turnips appears on the gum tree at the early stages of its growth; therefore some colonists hastily concluded the turnip blight was introduced through it. And again, it has been said no other plant will thrive in its vicinity. But this may be urged with more or less reason of all forest trees. It is not adapted for planting round gardens, and if planted close to houses, its leaves may be blown into the water-runs on the roof so as to choke them. But it is, nevertheless, a most valuable tree, and has taken kindly to the climate of Otago. Gum seed sown in 1866 almost at sea-level, and on moist soil, has now produced trees girthing at base from 4 to 5 feet, with straight balls up to 30 feet.

The *Auckland Herald* puts in the æsthetic plea for Government Forest conservancy of such gigantic specimens of the kauri as adorn the province. Tourists are beginning to frequent North New Zealand; and for their sakes alone the old monarchs of the forest should be conserved.

SPRING VEGETATION.

THE genial nature of the past winter has, in this district, caused an early development of leafage, which is generally ahead of what it was at the same period last year. Arboraceous vegetation promises well, and if this early growth is but unchecked by nipping frosts or the cold cutting winds to which unfortunately, even in this favoured district, we are susceptible, we may augur well for not only a good season of bloom but, in the woodlands, a leafy canopy of the thickest and richest description. In favoured situations the horse chestnut is already in leaf, soon to be followed by the sycamore, maple, elm, and thorn. We cannot remember having seen such a glorious display of early flowering shrubs as has been general during the past few weeks. Long before the rough winds of March had subsided, the bright, showy blossoms of the mezereon (*Daphne mezereon*) adorned many of our woodlands; indeed, the profusion of bloom was something grand and unusual.

The pale yellowish, drooping flowers of the spurge laurel (*Daphne laureola*) hanging in clusters under its dark, glossy leaves are also attractive, and afford a rich contrast to those of the latter plant. The anemones (blue, pink, and white), the lovely little wood sorrel, the gloryless or moschatel (*Adoxa moschatellina*) with its pretty yellowish-green flowers, primroses, violets, vincas, and the marsh marigold are all in their beauty, and quite enliven our open woods at present.

The Lent lily (*Narcissus pseudo-Narcissus*) and the common double daffodil (*N. Velomonius plenus*) have been grand in the extreme, and well merit the attention they at present receive.

A. D. WEBSTER.

PENRHYN CASTLE, SOUTH WALES.

TRADE CATALOGUES.

MESSRS. JAMES DICKSON & SONS' *Catalogue of Select Farm Seeds, with Original Illustrations of the Grasses of the Field* (Chester, 1885), came too late to hand for notice last month, but will be invaluable to those contemplating estate improvements; as also will be the *Illustrated Catalogue of Patent Continuous Wrought-Iron Fencing, Entrance and Field Gates,* as well as other like erections, just issued by G. B. Smith & Co., Keppoch Hill, Glasgow.

THE ENTOMOLOGIST.

WILLOW BEETLE.

(*From "Report on Injurious Insects for* 1884.")

By Eleanor A. Ormerod, Consulting Entomologist of the Royal Agricultural Society.

The Willow Beetle, *Phratora Vitellinæ*, Linn., is a small oblong-oval, shiny beetle about the sixth of an inch long, of a bronze or green or bluish tint above, more brassy below. These beetles come out in the spring from their sheltering places, and feed on the leaves of various kinds of willows, also of poplars. Later on the caterpillars or grubs hatched from the eggs of these beetles continue the mischief.

These whitish spindle-shaped eggs are laid in small patches on the surface of the leaves,—perhaps invariably on the under surface. The eggs are protected by a loose transparent membranous film. The caterpillars which were forwarded were about half an inch long when full-grown, pale yellowish or whitish, with black head; the segment next the head nearly all black above, and a squarish black mark above the two last segments of the grub; the intermediate segments variably marked with black, amongst which a more or less interrupted series of black marks down the back and black spots on the sides, largest on the three segments next the head, were the most noticeable.

These grubs feed on the under side of the skin of the leaf, working right through until the upper surface is only a film, which dries and cracks away. When full-fed the caterpillars *turn to chrysalids in the ground*, and from these a second attack of beetles comes up in the autumn.

The beetles sent were of various tints, and I incline to think the *Phratora vulgatissima*, Linn., was present amongst them, but this does not affect the matter practically.

It will be seen by the following notes that one of the main points to be worked on for *preventing* attack is that of *the beetles wintering under old or loose willow bark, or under rubbish on or near willow grounds*, and, in short, like the nearly-allied "Mustard-seed" Beetle, in any snug shelter, but especially such as is formed of rubbish of the plant which is its summer food.

On the 21st of May, Mr. Cosmo Melvill wrote from Kersal Cottage, Prestwich, relative to the Willow Beetle, *Phratora*

Vitellinæ, which had then lately made its appearance in extensive willow beds at Lymm, Cheshire, and was becoming so alarming a nuisance there in its inroads on the osier beds as to call for unusual exertions to withstand it, and information as to what could be done to extirpate the pest was asked in behalf of the growers of the locality.

On the 28th, Mr. Melvill further mentioned that every day the ravages of the insect were extending, and they were *being carted away in bushels.* Paraffin was then being used, and "apparently with some success." The following note regarding the widespread nature of the attack was forwarded:—

"For some weeks past the willow growers in Lymm, Statham, Thelwell, and other places in Cheshire, have been troubled by the appearance among their willow beds (some of which are extensive and very valuable) of numbers of beetles which threaten to destroy all the willows in the neighbourhood, unless the means that are now being tried prove effectual. A meeting was held at Lymm for the purpose of considering the best means of exterminating the pest, and a resolution was carried which pledged the growers present to continue the use of paraffin oil, with the object of catching the beetles. By this means one grower has caught some millions in one day, and it is believed if this course is followed up the crops will be saved."

On the 29th of May, Mr. H. Cameron, writing from Lymm, Cheshire, informed me that the willow growers in that district, who were suffering from this insect scourge, had formed themselves into a society for mutual protection and interchange of experience. Of this society Mr. Cameron was the chairman. He informed me that—

"The remedies hitherto tried (but so far with little success) are dusting the young shoots with hellebore powder, soot, sulphur, lime, and spent gas-lime. *The plan now adopted is to hand-pick, or rather shake off, the insects into small vessels containing a small quantity of paraffin oil.* This plan has been steadily carried on by many of the willow growers during the last fortnight *with marked success;* but unfortunately a few people take little or no notice, and I fear these neglected lots will pollute the surroundings.

"I am disposed to believe that Paris-green, which you recommend, would be a likely cure." [On trial (as noted subsequently) this application proved useful.—Ed.]

On the 31st of May, Mr. Cameron further informed me that at a meeting held the previous evening most of the gentlemen present reported a great diminution in the number of the beetles, but that he found, on going over the willow beds before writing, that there were still great numbers left.

Relative to the sheltering of the beetles during winter under any old bark or similar rubbish at the willow grounds, which is a most important point in considering how to get rid of them, Mr. Cameron remarked:—"Some of our members inform me that during last winter they found a large number of the perfect beetle under the rough bark of the willow trees, and one grower, who has a wooden hut erected on his willow field, found, on accidentally removing some of the boarding of this, that the beetles were wintering there in numberless quantities.

"Another informs me that he has found them largely under the bark of old fencing-posts, old boards left lying on the ground under the flood-line, etc.

"This being known, I think some means of trapping during the late autumn or early winter might be devised and prove useful.

"As regards area of land under osiers, I am not very wide of the mark in saying we have about fifty acres in the Lymm district, and I dare say the adjoining parish of Thelwall, which is affected as Lymm is, will grow a like acreage."

On the 25th of June, Mr. Cameron noted further, relative to estimate of value of willow crop:—

"I mentioned that there may be about fifty acres of willows grown in Lymm district, and I feel pretty certain that unless means had been taken early to supress the beetle, the whole crop, on an average, I am told, worth about £1000, would have been lost. The sum, however, means only the loss of the crop for one year; and, if this should happen, the old stocks would not live; consequently the land would require trenching, paring, and burning and replanting the following year, the replanting alone costing something like £15 an acre, and still the risk of being eaten up afterwards.

"Picking has been the chief remedy resorted to, but I have got a ten-gallon can, made pretty much on the lines of the one recommended in a report you sent to Mr. Melvill for distributing Paris-green solution.

"The Paris-green we had difficulty in getting, but a supply has now come to hand, and experiments are being made. One man dressed a few willows three days ago, and he is sanguine of success. Growers are afraid to use this solution for fear of damaging the willow, but so far their fears have proved groundless.

"As to the extent of the attack, I cannot say much further than that in the district between Warrington and Lymm, a distance of five or six miles, all the willows are affected pretty much alike. At Thelwall, which is about midway, the beetle has been troublesome for twenty years, but not until three years ago did it give any trouble in Lymm. About that time a few plants were affected adjoining the river; last year these plots were very nearly worthless, and other plots were attacked; and so the plague has spread.

"This year (1884) I have no doubt the exceptionally dry season has largely encouraged the increase of the insect. I am told that in Thelwall district, gas-lime, sulphur, hellebore, soot, etc., have been tried as preventives, but without any good effect, and hand-picking has been looked upon as the only remedy. I am sending some more specimens of leaves and grubs."

On the 24th of July, Mr. Cameron forwarded some more grubs of willow beetle, and concluded his series of careful notes with the information that the young willow crop was then doing fairly well, and the beetles upon them doing little harm; but on two or three year old plants considerable harm was done.

The Paris-green had been most satisfactory of all the dressings which had been tried. "Indeed, *I believe by applying this dressing* early enough the beetle might be kept fairly well under, the difficulty at this season of the year being to get the wash distributed; the willows grow so thickly on the ground and so high that any spray distributed cannot be used. I find the willows are easily damaged if Paris-green is used stronger than the quantities given by Mr. G. Leigh in his notes. *I think our safety is in early spring work, and trapping of some amount in early winter.*"

Mr. W. Worthington, writing from Wigan on the 28th of May, mentioned "that the Willow Beetle was doing much damage to the willow crop in some parts of the country. Specimens were sent from willow beds about ten miles from Wigan, which had suffered heavily in the previous year. The beetles had again attacked the willows in great numbers, and a large staff of hands had been engaged in hand-picking. Many ways of getting rid of them had been tried, and paraffin oil had been found the most destructive, but unfortunately it also injured the plants.

"It was noticed that there were two visitations of the pest—the first in May, *when the old beetles* leave their winter quarters; the second later in the season, just before the willows begin to ripen. The insects then settle in vast numbers on the tender leaves and shoots of the plants, and in an incredibly short time do an immense amount of damage.

"*When the beetles* leave the willow beds in autumn they conceal themselves in old fences, hay and corn stacks, crevices of old buildings, etc., where they pass the winter, and emerge to commence their depredations in the following spring, when the willows have got into leaf."

The above letter was kindly forwarded to me by Mr. S. L. Mosley, from Beaumont Park, Huddersfield, with the mention that the Willow Beetle was very common in that neighbourhood, but on poplars; and accompanying he forwarded specimens of the beetle and the injured poplar leaf.

Now, looking over the results of the above observations, firstly as to what remedies have been tried and failed, the knowledge of which will save time and expense in future attack, it is noted that soot, sulphur, lime, and spent gas-lime, arsenic, and likewise hellebore, failed to do good.

Hellebore has not, as far as I see, been tried as a means of destroying the grubs, but Mr. G. H. Leigh's careful experiments appear conclusive as to its being useless for destroying the beetle. Paraffin is noted as of use, and hand-picking obviously cleared enormous quantities of the pests; but, as a direct remedy in the way of application to the willows, Paris-green appears to have acted best. This poison has the merit of being an application which has now been tried for many years, and found serviceable regularly on the vast scale on which it has been used in the United States to keep down Colorado Beetle, which is, like our Willow Beetle, a *Chrysomela,* and much like it in habits; and if during the time before the beetles come out some of the willow growers were to have a tin can made on the plan of Mr. Cameron's, and learn where Paris-green was purchasable, as there is often great difficulty in procuring it on the spur of the moment, it would probably save much money in the end.

In the mixture given as Mr. Shearer's recipe there is no difficulty as to separation of oil and soap; the can would give a proper method of application, and the stickiness of the soft-soap would ensure the leaves remaining (except in very wet weather) in a condition thoroughly repulsive to the beetles, whether for food or egg-laying.

The great point, however; is *forestalling attack,* and in the above observations with which I have been favoured it will be seen that the enormous importance of doing this by clearing away loose bark-rubbish, rubbish below flood-line, etc., is *again and again* dwelt on.

But there is yet another important point. This attack is one in which non-attention on a single willow ground does mischief to all near. The willow growers wisely formed themselves into a society last season to attend to the extermination of this pest, and the result has been, as shown above, that in a few months they have learnt its history, and what measures are or are not of service in checking the attack. If they should think fit to continue to thus co-operate at least for another season, so that they might be fully cognisant of the effects of all methods of treatment, and likewise of those of absence of attention to the subject in their district, the occasional time given to the meeting would certainly be repaid.

LETTERS TO THE EDITOR.

GROWTH OF GRASS AMONG TREES.

SIR,—Would you be so kind as favour me with your opinion whether you consider it to the advantage of ordinary park trees that the grass be allowed to grow up amongst them, or that it is better the surface be made bare and the trees dug amongst? Trees say from 12 to 15 feet high. JOHN WILSON.

LEAZES PARK, NEWCASTLE CITY,
28*th March* 1885.

[When trees have attained a height of 12 feet, and are growing vigorously, the growth of grass among them can do no harm; so long as it is mown once or twice a year, and is not allowed to become overrun with coarse and noxious weeds. To keep the surface bare among such trees, and to dig the ground, will result in doing more harm than good, by destroying the best feeding roots near the surface, and sending those left deep into the subsoil where they seldom thrive. Among newly-planted park trees, it is beneficial to keep the surface clear of grass and rank weeds for a year or two, till their roots have taken possession of the soil and their tops have grown up out of danger of being smothered by rank vegetation. The weeds should be kept down by a free use of the hoe; and if the soil requires stirring, it is much better to do it with a fork than a spade, so as to avoid as much as possible injury to the pushing young roots of the trees.—ED.]

A GRAND SIGHT.

SIR,—Last Boxing-Day, I made my way some thirty miles into the country, on purpose to see a tree felled.

The men were hard at work, sawing and wedging, when I reached the spot—just within the walls of a noble duke's park. It was an immense cedar tree—fully (I measured it with the tape I had brought with me when cut down) 80 feet long, with two limbs each 50 feet, and 20 feet round the base; and the tree, if I am right in presuming each separate ring shown when felled to count as one year, was 115 years old. Never did I feel that a day's outing had been so well repaid.—Yours respectfully,

W. KING.

FORESTERS' AND GARDENERS' BENEVOLENT INSTITUTION.

SIR,—I observe with pleasure the reference to the above in your last issue. I think it is a step in the right direction, and I trust it will shortly be put into a practical form, and it will certainly provide a long-felt want.

Would it be too much to suggest that the Secretary of the Scottish Arboricultural Society might issue circulars to all the members asking their opinion on the matter? FORESTER.

OAK PLANTING.

SIR,—I should be much obliged to you or any of your readers who would be kind enough to answer the following questions respecting the growing of oak from acorns:—

1. What is the best method of sowing acorns in the nursery?

2. How long should the plants remain in the seed-bed?

3. Should the tap-root be cut? and if so, how much should be taken off at the time the plants are taken up from the seed-bed for transplanting?

4. How long should plants stand in the nursery lines? and what height is best to plant out into woods in a windy country?

5. Should the plants be pruned at all whilst in the lines? and if so, when?

6. If not pruned then, should they be pruned when planted out?

7. Would it be a good plan or not to cut the tap-roots of the plants whilst growing in the lines with a sharp spade? Will it encourage small roots in place of a very large tap-root, which is cut off usually when the plants are put out into the woods?

8. Is the pruning of small scrubby plants in the nursery necessary? and is it a fact that in their early stages young oaks often look unpromising, but become generally good plants by throwing out a good leader when once established?

9. Will ash plants dug up from under ash trees in a wood, chiefly springing up as suckers, become good trees if taken up and transplanted straight into the woods? or would they be better for one or two years in the nursery?

W. S. O.

April 18, 1885.

REVIEWS OF BOOKS.

FORESTRY IN NORTH-WESTERN PROVINCES OF INDIA.

Progress Report of Forest Administration in the North-Western Provinces and Oudh for 1883–84. By G. GREIG, Esq., Conservator of Forests, Central Circle; Captain E. S. WOOD, Conservator of Forests, Oudh Circle; and W. R. FISHER, Esq., B.A., Offg. Conservator of Forests, School Circle. With a Review by the Lieutenant-Governor, and Orders by the Government of India. 1885.

THE exigencies of war may now make such demands on the forestal wealth of the Himalayan districts, as to render necessary the immediate extension of the reserves of the North-Western Provinces desiderated by his Excellency in Council in the above report. The forest lands at present represent about 3 per cent. of the total area of the province, comprising 3597 square miles.

Amongst other matters of general interest, we note some friction in the staff department. The Governor in Council desiderates a closer agreement in the annual operations with what is proposed in the working plans. In the School Circle it appears necessary that the present numerous staff of inferior foresters on low pay be replaced by rangers of superior standing. Theft and infringements of the Forest Laws abound. On the plains' divisions a forester on Rs. 15 per month, out of which he is expected to provide uniform and a pony, is frequently in charge of 12 to 20 square miles of forest, in which the standing timber has an actual market value of several lakhs of rupees; and during the cold weather, besides the protection of the forests, he has to supervise building, road-making, fire conservancy, climber-cutting, and plantation works. Whether pensioned sepoys should be employed is worth considering. It is noted that only two natives in this circle have passed through the Forest School, both of whom failed to obtain the rangers' certificate.

During the third course of theoretical instruction held from 1st July to 31st October at the Forest School, thirty-six officers of the subordinate staff, and one of the superior staff, attended. The course, which included Forestry, Botany, Physical Science and Chemical Practice, Law, Mathematics, Surveying, Road-making and Building, as well as Entomology, was given solely by officers of the circle. At the close of the course, twelve students of the second year obtained the rangers' certificate and returned to their own provinces; six failed to obtain certificates, of whom three were remanded for another year's study; but they, along with the first year's students, engaged in the practical forest work of the School Circle or in the working plans or forest survey branch. Cheerful, intelligent, practical work was thus done by those eighteen students.

In the Oudh Circle the destruction from forest fires has been severe. In one of the two fires caused by lightning in the Central Circle, no less than 4196 acres were burnt. In the Oudh Circle, 800 square miles out of 1090, and in the School Circle 568 out of 727, are open to grazing, forming the pasturage and breeding-grounds of three-quarters of a million of cattle, and involving many delicate questions as to villagers' rights, and the like.

The attempts to cultivate species of the *Eucalyptus* in the hill divisions have not succeeded, though it has done better at Dudna in the Oudh Circle.

There is a striking disproportion in the average out-turn of each tree felled in the several circles. The average cubic contents of the trees felled in the Central and Oudh Circles are somewhat below 10 cubic feet and 2 cubic feet respectively; in the School Circle they exceed 80 cubic feet.

From the Ganges division of the Central Circle 980 cubic feet of boxwood were sent to England, which was highly appreciated, and sold at the rate of £25 per ton.

The Deota sledge road, in the School Circle, is the first attempt to introduce on the Himalayas a method of transporting timber and fuel which has been in use for centuries in the mountain forests bordering the Rhine Valley. Rejected 6-feet deodar sleepers are laid 5 feet apart along a roadway with gradients from 5° to 10°, 7° being apparently the best of all, and ballasted up with broken stones, etc., and cross sleepers at distances of 2′ to 2′ 3″ are bolted on to them. On these latter the sledges run in grooves cut 2′ 2½″ apart in the cross sleepers, and experience has shown that 20 to 25 sleepers can be easily conveyed by two men.

About 6000 feet of the roadway were completed during the year, about 1000 feet remaining. Eight timber viaducts, and bridges of an aggregate length of 550 feet, were also made.

U. S. Department of Agriculture, Miscellaneous. Special Report No. 5. The Proper Value and Management of Government Timber Lands and the Distribution of North American Forest Trees, being Papers read at the United States Department of Agriculture, May 7-8, 1884. Washington: Government Printing Office. 1884.

Besides the paper which our space only allows us to give in an abridged form in another part of our issue, this pamphlet also contains a paper on the Value of American Timber Lands, by Franklin B. Hough; another on the same topic by F. P. Baker; one "On the Preservation of Forests on the Head Waters of Streams," by M. C. Read; and another on "The Distribution of North American Forest Trees," by Dr. George Vasey. Never in forty-eight pages have we found such an amount of forestal fact and argument.

The Journal of Microscopy and Natural Science: The Journal of the Postal Microscopical Society. Published Quarterly. Edited by ALFRED ALLEN. April. London: Bailliere, Tindall, & Cox.

Chironomus prasinus, a very common denizen of our ponds, water-butts, etc., is minutely described by Mr. Hammond, who, moreover, elucidates verbal details of structural appearance under the microscope by two beautiful lithographs. The tyro is put in the way of knowing that the question, What is a plant? has from recent researches become invested with a new interest; he is told how to use the microscope, and introduced into new mysteries of animal metamorphosis and pond life. Altogether, the solitary student of science will find this an admirable eighteenpence worth. Indeed, a few years since he might have had to pay double for an inferior bill of fare.

Eighth Report of Observations of Injurious Insects and Common Farm Pests during the Year 1884, *with Methods of Prevention and Remedy.* By ELEANOR A. ORMEROD, F.R. Met. Soc., etc.; Hon. Consulting Entomologist of the Royal Agricultural Society; Hon. and Corr. Mem. of Royal Ag. and Hort. Soc., S. Australia etc. London: Simpkin, Marshall, & Co. 1885.

This annual volume has now come to be one of the events of the agricultural and arboricultural year, whose publication is anticipated and heralded by the community of general and special journals, from the *Times* downwards. We do not now propose further to analyze this publication, as we make a considerable extract under a special department, and shall again recur to it. In the interval, our readers should not miss the opportunity of studying its interesting and important pages for themselves.

FOREST WORK FOR THE MONTH.

ENGLAND.

MAY, although sometimes subjected to the chilling effects of easterly or north-easterly winds at the beginning, is in general genial and cheering. The mean temperature in England is about 52°, but this varies largely in different sections of the country. The records of the thermometers often exhibit great differences between the temperatures of day and night. The mean rainfall is under 2 inches; but this also varies over different parts of the country.

Last year, the rainfall at Greenwich for May was 0·94 inch; below the average of the previous ten years by 0·84 inch.

The rainfall recorded for the same period was, at—

Edinburgh, ...	2·42 inches
Glasgow, ...	2·83 „
Clifton, Bristol, ...	2·50 „

showing, as usual, an excess of moisture along the western side of the country.

In this month, our woods, hedges, and fields exhibit a daily improvement; and the freshness and fragrance of the air invigorates all nature into gay activity and interesting beauty, exciting our admiration and gratitude.

ORCHARD.—During dry weather, water late-planted trees and bushes, and do this effectually, quite saturating the ground. Look for the caterpillars of the lackey-moth, and destroy them whilst in the early stages of their existence. They are very destructive to some kinds of fruit trees, and are amongst the most constant and troublesome of the insect pests with which gardeners and foresters have to contend. The eggs of this moth are to be found on almost every kind of shrub and tree, in gardens, orchards, hedges, and woods, remaining on the twigs like skilfully-manufactured pearl bracelets, for fully nine months before they are hatched. These caterpillars sometimes swarm in myriads throughout entire districts, and feed voraciously on the leaves of several kinds of fruit trees—hazel, hawthorn, blackthorn, and oak; stripping the best of the foliage before they begin to change their state. I think a liberal application of some of the insecticide washes might prove a check to their ravages; but every opportunity should be taken to destroy the moths themselves when seen upon the wing.

FENCES.—Make regular and repeated examinations of the fences around the woods, and see that they are kept in efficient repair. Give very particular attention to young thorn hedges, hoeing and digging along their bottoms to keep them free from weeds. In planting holly hedges during this month, the roots should be puddled and well watered. During very dry weather, the watering of all kinds of young hedges may be of much service to ensure their success. Fences of bricks, or stones and mortar, that were erected during the winter, when the pointing-in could not be judiciously done, should now be pointed and finished.

PLANTATIONS.—Trees that have been propagated in pots may now be planted out into soils and positions best suited to their full development, and protected by stakes, etc. Look carefully through recently-planted young plantations, especially after a heavy rain succeeding a track of drought; and have all the cracks in the soil around the plants tramped up, and the plants set erect and firmed in that position.

The labourers on an estate are sometimes allowed to dig amongst the trees in young plantations, and crop between the rows with potatoes, etc., under the pretence of keeping down weeds. I do not approve of this; and have frequently seen its mischievous effects, more especially in dry seasons, and when the greed of the digger led him to crop too close to the trees. Where weeds grow in greater luxuriance than the young trees, the timely application of a hook amongst the rough herbage that confines the plants, is a cheap and effective method of affording them light and air.

Owing to the dry and cold airs of March and April, the flow of sap has been retarded, and the barking season rendered later than ordinary. Where large falls of oak have to be made, this may prolong peeling operations to the end of the month. In coppice woods it is of great importance to clear up, and clear out the whole of the cuttings as speedily as possible, to allow the stools to shoot afresh.

NURSERY.—Finish sowing pine and fir seeds this month; and while the weather is suitable, keep the hoes and rakes going in the destruction of weeds. Run a light roller of the hard surface of seed-beds. Begin weeding as soon as the plants appear; early work of this kind ensures the growth and success of the plants.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

ALL tree planting should for the season have already been finished. Rhododendrons may, however, still be removed with safety, possessing as they usually do the threefold advantage of being well rooted, very hardy, and large balls of earth attached, thereby rendering them more safe of removal than probably any other shrub grown in this country. All common hedge cutting and pruning should also have already been finished; but to this rule there is one exception, namely, that of cutting over very old thorn bushes or hedges. For reasons too tedious to explain here, old thorn hedges are much safer to be cut over towards the end of May, when partially out in leaf, than at any other season of the year. Thorns or quicks too old to cut over successfully during the winter months, will, when cut over, now produce buds and young shoots, and spring forth vigorously the second season; whereas, if cut over in winter, or even in autumn, they very frequently die outright. Pruning ivy-covered walls, trellises, etc., and evergreens of all sorts should now be proceeded with as expeditiously as possible, and all withered, injured, and decayed foliage neatly removed. Where tidiness and pleasing effect are pre-eminently desired, close attention to evergreens is of primary importance, and if neglected now they remain an eyesore all the season round. Though grafting and propagation work generally belong more properly to the nurseryman than the forester, yet where a home nursery is kept, and where the duties of the forester necessarily embrace these, now is the time to have them finished. Grafting is a work that must be learned practically, and no amount of written instructions can suffice for the learner, to whom one single lesson by example will teach more than any amount of verbal instruction. The main work of seedling planting should have already been done, and the seed-sowing accomplished as soon as the ground is sufficiently dry to work properly; and on no account should it be wrought when wet. Better delay the work three weeks past the ordinary time of sowing, than sow at the regular time when the soil is wet and unfit for receiving the seed. The seed-beds are usually formed 4 feet wide, with alleys between them 15 inches. The seeds should be covered with fine earth, about half an inch thick, rather less than more; and the seeds previous to sowing should be first wet with water and afterwards well rubbed or dusted over with red lead in the powdery state. This is to prevent the wild birds from eating it, which they do rapaciously, at same time picking off the tops of the seedlings as they rise above the ground, or uprooting them altogether. Various means have been employed to prevent the birds from eating the seed, but of all others I have seen, this I regard as the cheapest and most effective.

The next, and on many estates by far the most important, work for the month is that of bark harvesting, and oak of all others constitutes the main subject. Larch, as well as oak, on some estates is also peeled, and leaves about as good a margin in favour of the proprietor as oak does. Alder and birch are also on some estates peeled; but this is rarely done merely for the sake of the bark, but in order to enhance the value of the wood for charcoal purposes, which is used in the manufacture of powder, for which purpose it requires to be peeled or shaved clean of bark.

Although it cannot be expected that sufficient directions can be here given to enable the inexperienced to execute such important work as that of peeling and harvesting bark, yet a few general directions may, it is hoped, be found acceptable to some who may not have had the opportunity of seeing it done in the best and most advantageous way, or in any other than their own.

In the first place, the bark should be taken off with the peeling-iron in lengths of 3 feet or thereby, and that from the trunk or bole and limbs about a foot broad, and from small trees and large branches quite round. No beating with mallets should be allowed in doing the work, as it very much discolours and injures the quality of the bark. The drying should be done by first erecting a sort of rest for the bark to stand against, the pieces being set on end along both sides at such support, and sloped so as to stand securely, and the pieces meet together at the top like the roof of a house in miniature. The bark set up in this form dries very quickly, and is less liable to injury by damp or wet weather than dried in any other way. The support is usually of a very temporary and cheap construction: sometimes a line of rope-yarn supported on small stakes driven into the ground to about 2 feet high, sometimes a small paling rail is run along the posts. In other cases where convenient, it can be set up against a wire fence or wooden paling, whichever best suits the convenience of the place; and when sufficiently dry for storing, no time should be lost in doing so, which should be in a dry airy place, where it remains till it is chopped or hitched. Larch bark is harvested much in the same way as oak, but is less liable to injury from damp or wet weather. It is, however, more brittle when dry, and requires to be as seldom and gently handled as possible. C. Y. MICHIE.

WALES.

THE cold east winds, with frost during the nights, up to the middle of April, have been much against vegetation; on the 16th, snow and rain fell continuously during the day; owing to the backward season, oak bark stripping will be rather later than last year. Under the circumstances, the work should be pushed forward with all available strength as soon as the sap rises sufficiently. Where not already done, finish the transplanting of evergreen trees and shrubs as early as possible. Great care will have to be taken in the removal of plants at this period, by having good balls of earth with the roots, as well as timely attention with water. Young fir plantations may still be thinned, and gorse, etc. cut away where interfering with young trees.

As time permits, continue the fencing and preparing of ground to be planted next season.

Erect wire and other fences, and tar or varnish the same during dry weather. The mowing machine will have to be kept going in lawns and pleasure grounds; and walks and drives kept clean and tidy.

As transplanting will now have been finished in the nursery, it will be necessary to keep down weeds, and loosen the soil between plants that have not been removed this season.

LEWIS BAYNE.

KINMEL PARK.

OBITUARY.

JAMES RITCHIE, long at the head of a well-known florist business in Philadelpha, died on March 11th, from suffocation with coal gas, coming from the heater through the register stove. Mr. Ritchie was in his 77th year, and was born in Edinburgh, whence he emigrated in early life. Mr. Ritchie wrote much on steam heating in horticulture.

Intimation has been received of the death of Mr. Edwin Fuchs, of the Indian Forest Service, who was associated with us as juryman at the International Forestry Exhibition. This promising young officer died at Bad-boll, in Germany, on 5th April.

LEGAL.

THE GREENOCK RAILWAY COMPENSATION CASE.

SOMMERVILLE *v.* GLASGOW AND SOUTH-WESTERN RAILWAY COMPANY.

JUDGMENT was given in Greenock Sheriff Court, after a six days' sederunt, in the case arising from the claim by Messrs. Sommerville & Co., Caledonian Sawmills, Bogston, Greenock, against the Glasgow and South-Western Railway Company for compensation estimated at £80,077, 14s. 11d., for loss of lands, buildings, and business through the operations of the railway company in connection with their extension to the James Watt Dock. Mr. Wyllie Guild, C.A., Glasgow, was the last witness for the railway company, and in the course of his evidence stated that he had gone over Messrs. Sommerville's books, and distinguished what the gains and losses were in the buying, selling, and sawing of timber, from the year 1875 to 1884. In 1883 there was a loss on timber of £1067, 13s. 11d. and a profit on sawmilling of £1862, 7s. 8d., showing net profit of £794, 11s. 9d. In 1884 there was a loss on timber of £902, 4s. 11d. and a profit on sawmilling of £292, 6s. 8d., making a net loss of £600, 18s. 3d. For the ten years ending 1882 he found an average combined profit of £2652, 12s. 2d.; and for seven years ending 1882 he found an average combined profit of £2238, 6s. 10d. The land for which Mr. Sommerville claimed compensation is in extent 38,753¾ square yards or thereby, and there are erected upon it, besides a tenement of dwelling-houses and office, other buildings and erections, which are fitted with boilers, engines, and other sawmilling appliances.

The jury unanimously agreed to award £52,658, 6s. 7d., allocated as follows:—Taking the land at 16s. a square yard, the amount is £31,003, which, with a reduction in respect of feu-duty, £5015, 12s. 8d., gave a total of £25,987, 7s. 4d., to which 10 per cent. added for compulsory sale, £2598, 14s. 9d., shows a total for the ground of £28,586, 2s. 1d.; for buildings and machinery, including 10 per cent. for compulsory sale, £14,572, 16s. 3d.; for loss of business, £9499, 8s. 3d.—total, £52,658, 6s. 7d. The tender of the railway company before trial was £55,000.

In connection with other valuation claims which the Glasgow and South-Western Railway Company recently submitted to juries in Greenock, it may be mentioned that for foreshore ground Mr. Watson was awarded 25s. and Mr. Fullarton 23s. 6d. per square yard, while Mr. Sommerville's award is only 16s. per square yard.

CHIPS.

THE TREE CONUNDRUM.

The "tree puzzle" that follows is one of the most ingenious trifles of the kind now current :—

1—What's the social tree,
2—And the dancing tree,
3—And the tree that's nearest the sea?
4—The dandiest tree,
5—And the kissable tree,
6—And the tree where the ships may be?

7—What is the tell-tale tree,
8—And the traitor's tree,
9—And the tree that's the warmest clad?
10—The languishing tree,
11—The chronologist's tree,
12—And the tree that makes one sad?

13—What's the emulous tree,
14—The industrious tree,
15—And the tree that will never stand still?
16—The unhealthiest tree,
17—The Egyptian-plague tree,
18—And the tree neither up nor down hill?

19—The contemptible tree,
20—The most yielding tree,
21—And the tree that bears a curse?
22—The reddish-brown tree,
23—The reddish-blue tree,
24—And the tree like an Irish nurse?

25—What is the tree
That makes each townsman flee?
26—And what round itself doth entwine?
27—What's the housewife's tree,
28—And the fisherman's tree,
29—What by cockneys is turned into wine?

30—What's the tree that's got up,
31—And the tree that was lazy,
32—And the tree that guides ships to go forth?
33—The tree that's immortal,
34—The trees that are not,
35—And the tree whose wood faces the north?

36—The tree in a bottle,
37—The tree in a fog,
38—And what each must become ere he's old?
39—The tree of the people,
40—The traveller's tree,
41—And the sad tree when schoolmasters hold?

42—What's the tree that has passed through the fiery heat,
43—That half-given to doctors when ill?
44—The tree that we offer to friends when we meet,
45—And the tree we may use as a quill?

46—What's the tree that in death will benight you?
47—And the tree that your wants will supply?
48—And the tree that to travel invites you,
49—And the tree that forbids you to die?

NOTICE TO CONTRIBUTORS AND CORRESPONDENTS.

IT is absolutely essential that all MSS. for insertion should reach the Editor *not later* than the 15TH OF EACH MONTH, *and at an earlier period of the month whenever possible.* Books for review must also be sent before the middle of the month. Communications for the Editor's Box should be as *short* as possible. The place for long contributions is in the body of the magazine. It is a *great assistance*, both to editor and printers, for MSS. to be well and legibly written, and on one side only of the paper.

FORESTRY

JUNE 1885.

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EDITORIAL NOTES.

The Ash and the Oak.—The time of leafing of these two trees has formed the subject of a correspondence in the *Standard.* W. H. C. seeks to correct the statement made in May-day leader that it looked as if there would be a dead heat betwixt the two trees; having observed their comparative development for twenty years, he has never once known the ash to come out before the oak. Granting individual exceptions, the ash has always been second in the race. Thomas Southwell quotes a series of natural history observations, entitled "Indications of Spring," kept by the Marsham family at Stratton Stranless, Norfolk, commenced in 1736, and continued to the present year, which show, in a record for eighty-five years, the oak came into leaf first on fifty-two occasions, the ash on twenty-seven; while there are six instances of the leafing of both trees happening on the same day. The mean time for the leafing of the oak for one hundred and five annual observations is April 25, and that of the ash for eighty-five observations April 29. On turning to the *Cobham Journals,* by Caroline Molesworth, Surrey, we find recorded on April 23, 1826: "Ash and lilacs fl.; oak fl. above a fortnight."

The Elm.—Miss Omerod, the editress of the journals above alluded to, which were kept from 1826 to 1850, points out that the elm is shown in them to have an amplitude of flowering, or difference between the earliest and latest records of first observation, comparable to that of the sloe and the common laurel. The mean periods of first flowering observed during twenty-four years were respectively fifty-seven, sixty, and one hundred and fifty-two days. But the elm has a large amount of surface-roots; sloe has also creeping roots, throwing up suckers in every kind of locality; while the laurel is peculiarly susceptible of cold. The dates of the foliation of the elm vary much in accordance with the characteristics of the season. Thus the latest date recorded is on June 6th, 1837, after three months with deficient temperature and rainfall of little more than half the average. Late defoliation appears to follow or accompany much rainfall; that in 1826 followed a wet November; while the still later fall in 1827 was preceded by much rainfall in October.

East African Forestry. — Two distinct tree zones may be traced up the Shire river to Mount Zomba, the site of the Church of Scotland Mission Station. Below elevations of 2000 feet, the Baobab flourishes, and with it is associated the Mimosa and Tamarind trees, while at the higher elevations of 3000 feet the *Napaca kirkii,* whose native name is Msuku, *Kahya Senegalensis,* or the Mbawa, help to give an unique scenic character to the mountain ranges. The blue-tinted young leaves of the tree from which the native bark cloth is chiefly taken, are visible for miles. There is no proper forest, except in the jungles and ravines down the mountain-sides; while on the plains there are few large trees, though viewed in the distance they appear well wooded. Mr. John Buchanan, from whom we quote, states that on the plain near Lake Shirwa, as well as on the river, lines of acacias, often in a foot of water, fifty yards wide, run at right angles to the banks, while the intervening space is grassy plain, on which at wide intervals may be seen a stunted shrub. In the villages on the Shire river, the huts are built closely together, and overshadowed by stately Baobabs, as well as higher native trees, whose trunks rise straight for some forty feet or so. Before the huts, women are scattered here and there pounding sorghum, while their liege lords may be basking on mats in the sun, or tying a grass fence round the family mansion. A stockade ten or twelve feet high, composed of cuttings which have since rooted, and are now a live fence, surrounds the encampment. The entrance to it only admits one man at a time, and it is surrounded by an arch of Euphorbia entwined with lovely climbers, which indeed may be met everywhere in the jungle on one side of the village.

When to cut Timber.—The *Albany Country Gentleman,* from forty years' experience, endorses an opinion lately published by Professor Budd, as the result of numerous trials made at the instance of the Russian Government, and given forth at a forestry convention in Moscow, that the best time to cut trees was near the end of June, while the bark would peel freely. Rails of young bass wood, summer cut and seasoned, become nearly as hard as horn; while winter cut is worthless, rotting in a few years. Professor Budd found poles of box-elder, cut in June, when peeled, dried, and set as posts for fences or sheds, had lasted sixteen years; while others similarly treated and used, but cut in winter and set green, rotted in four years.

LONDON BREATHING SPACES.—The Gravelpit Wood, having an area of 69 acres, at Highgate, has been offered by the Ecclesiastical Commissioners, through Lord Stanhope, for the perpetual use and enjoyment of the inhabitants of the metropolis, and accepted by the Corporation of London. It has been suggested that the great city companies should together purchase the adjoining churchyard—Bottom Wood, which, united with the above, would form a much-needed pleasure ground of 120 acres. But, as a correspondent has well observed elsewhere, the education of city children in the use of such privileges is as clamant as their extension. If the Prussian law, which holds parents responsible for the municipal offences of their children, prevailed here, such destruction as was recently effected by juvenile wrong-doers on the newly-planted plane trees along Kennington Road, S.E., would be impossible.

ROMNEY MARSH.—Mr. A. J. Burrows traced the past and present history of this celebrated Kentish agricultural district in a paper communicated to the Surveyors' Institution. The numerous churches in the Marsh noted amongst other celebrated topographers by William Cobbett, do not prove the population to have ever been more numerous than at present. They appear to have been presented to the church in the hope of solacing their evil consciences by kings and nobles who were rude and licentious. The local government is of old date; and is administered by the lords, bailiff, and jurats. So valued is the position of a lord, that a piece of land whose possession carried with it the lordship of Craythorne recently sold for £153 per acre — ordinary marsh pasture. A good pasture in the marsh will carry six sheep to the acre from April to October, and three for the remainder of the year, besides a few bullocks. The sheep kept in Romney Marsh only vary from 150,000 to 180,000, according to the season. Mr. Burrows controverted the common opinion that the marsh land once broken up will not lay again in grass. But several of the Fellows disputed this. Mr. Webb had found on enclosing some land near the Swale, which ran into the sea by the mouth of the Medway, that the deposit on the saltings accumulated about 14 inches in depth in 100 years. According to Mr. R. Watermann, rents varied from £2, 10s. to £5 per acre. In most seasons the marsh was nearly clear from rot, while on land nearer the hills, in years like 1860, the sheep were all affected. When the water came from the hills on to the marshes, sheep suffered from rot, whereas nearer the sea they were perfectly healthy.

SIR ROBERT LLOYD LINDSAY'S GIFT TO THE NATIONAL LAND COMPANY.—Lambourne, in Berkshire, the farm of 400 acres purchased by the generous donor at £10 per acre, and given over by him to further the aims of this association, whose inauguration was chronicled last month, has since had many visitors and several newspaper descriptive comments. At present sixteen miles from a railway, and 500 feet above the sea level, at once recognised from soil characteristics by practical men as a sheep farm able to carry about 200 breeding ewes and a few cows, with also a great capacity for poultry farming, it does not appear suitable for cultivation by steam or spade, but appears adapted for co-operative farming. Mr. Fuller in the *Land Agent's Record* contrasts this spot with the flourishing Radbourne Manor Co-operative Farm in Warwickshire. On Lambourne there are only about two acres of meadow out of the 400 acres—the remaining 300 acres being a compound of thin hazel mould on the chalk, some of it so thin as to be unprofitable for cultivation, on a bleak hillside unfenced and not sheltered by trees. The low purchase price of £10 per acre tells both of ruin of the farm and previous owner. An expenditure of about £1500 will have to be incurred to put the place in proper order to test co-operative farming. When this is expended, the rental value will be about £150 per annum. If associate labour under a proper leader succeed here, it will be a guarantee of the adaptability of the system to any locality.

SOUTH AUSTRALIAN SYLVICULTURE.—The corporation of the town of Jamestown, which was formerly "a mud hole in winter, and a dust-heap in summer," have changed all that by judicious planting of over 20,500 trees of various kinds. About 70,000 trees have been obtained from the Forest Board of South Australia, and the 30 acres planted do not cost the town more than £70 per annum to maintain them in good order. Private enterprise has copied the example of the corporation well by also planting trees in numbers, that from the distant heights the town seems now to be buried in a forest.

THE WHITE PASSION FLOWER.—A lovely specimen now lies before us, sent by Messrs. Lucombe, Pince, & Co., of Exeter Nursery, who are making the growth of the *Passiflora Constance Elliot* a specialty. All the parts of the bloom excepting the styles are white, the fringe or hairy appendage of the corona and the petals being of ivory whiteness. The plant, which is as hardy as the common Passion flower, was awarded the first-class certificate of the Royal Horticultural Society of London last May.

UNITED STATES FORESTRY.—How well they do Government Reports in America is exhibited in the two large octavos of the Department of Agriculture, sent us through the courtesy of N. H. Egleston, head of its Forestry section, doubtless because the whole of the second volume is occupied with the matters we profess to expiscate, and contains 407 pages of closely-printed matter, besides innumerable maps and statistical tables, containing information equivalent to four such printed volumes. The companion volume of the *General Report of the Department of Agriculture* for 1884 also contains a special forestal section, beautifully illustrated. These two volumes shall be duly treated at greater length.

THE PUPILS AT THE NANCY SCHOOL OF FORESTRY.—In view of the recent discussion in the House of Commons as to the desirability of a British Forest School, it may be as well to remind our readers that the fees are considerable. Besides an initial payment of £42, an annual sum of £60 for board, lodging, etc., as well as £24 for the same period for pocket money, and also a fee of 1 per cent., have to be paid during the two years' course; and after its expiration, an annual sum of £24 has to be paid until the aspirant attains active employment as a *garde général.* An officer of this rank, either probationary or of the second or third class, holds a military status of a sub-lieutenant of the reserve or of the territorial army, whilst one of the first class ranks as a lieutenant of reserve. Indeed, the students are considered to be serving with the colours during their two years' course of instruction. Should they fail to pass the final examination, they must still serve as soldiers.

THE INDIAN FOREST SCHOOL.—An impartial study of the recent report of this institution at Dehra Dun leads us to conclude that it cannot replace a similar school in Britain for the advancement of home and colonial forestry, as hinted by Mr. Gladstone in the recent debate. Founded on continental models, British common sense is modifying the curriculum for the specific needs of Indian pupils. Thus Sylviculture has been separated from the theoretical instruction of the lecture-room in Morphological and Physiological Botany, and is now taught practically in the forests; while Mr. Clifford's course of lectures on Entomology has been expanded so as to admit the study of all injuries and diseases incident to forest plants, whether by animals, insects, or other plants, such as climbers, epiphytes, parasites or fungi, as well as the decay and preservation of timber. This is now termed Forest Etiology.

SUBURBAN VILLA FARMING.—A result of the success anticipated at Lambourne will be the spread of thrift amongst agricultural labourers and amongst all classes. To have divided the Lambourne estate into forty-acre lots, furnished with buildings and thoroughly drained, fenced, and stocked, would have required £1400 for each peasant proprietor. Now this is thoroughly out of reach of Hodge. Many retired citizens or even professional men might welcome such an opportunity of combining town and country life, provided railway facilities are at hand. Indeed, Mrs. Hill Burton, in her interesting and practical book *My Home Farm,* in which she details two such financially successful experiments where in both instances she was a tenant, sums up her experience by recommending all similar cultivators to be their own proprietors. When such a movement takes effect, the planning of gardens so as to admit more extensive employment of horse labour or machinery in place of the spade, will enter into its organization.

THE CANADIAN FORESTRY COMMISSION.—The *Annual Report of the Department of the Interior* for 1884, just issued at Ottawa by the Government of the Canadian Dominion, contains a summary of the preliminary report by Mr. J. H. Morgan upon the subject of the protection of the forests of the Dominion by the planting of trees on an extensive scale. He recommends that the Government of the Dominion should, without loss of time, appoint a Commission to co-operate with a similar Commission from every Province in the Dominion, to deal with the question of the protection of the old, and the reproduction of the new forests. The early navigators of the Canadian rivers and lakes were charmed by luxuriant forests of vast extent, where to-day no forest remains to check the chilling north-east gale travelling up the St. Lawrence from its home among the icebergs. Mr. Morgan concludes from his researches that fire has been a greater foe than the lumberman to the Canadian forests. Mr. Thistle, a surveyor and lumberman of great experience, puts the quantity destroyed by fire at ten times that used in the manufacture of lumber. And Mr. Stewart Thayne gave Parliamentary evidence that the annual loss from this cause alone in the Ottawa valley amounted to £1,000,000. An organization to prevent forest fires thus appears to be an immediate necessity.

THE HIMALAYAN WOODCUTS of our April number were originally made from Sepia drawings taken by Mrs. A. Smythies of Dehra Dun. Mr. Smythies further writes: "It is now quite certain that Mr. Graham never attained the great heights to which he laid claim."

ARBOR DAY.—This tree-planting day, the idea of ex-Governor J. Sterling Morton, of Nebraska, is becoming more widely celebrated every season since April 20, 1872, when it was inaugurated. Not only in Nebraska, where, through its influence, there are now more than 250,000 acres of cultivated woodland, nor in the near States of Kansas, Iowa, Minnesota, and Dakota, but even in Philadelphia and Ontario, have the school children assembled this year to partake in such good work. Could nothing similar be accomplished on this side of the Atlantic ?

TIMBER IN MANITOBA.—According to Professor Fream, the supply of wood for fuel is becoming a serious question in this new colony. The following list of Manitoba timber trees is arranged according to their frequency of occurrence in descending order:—Poplar, oak, ash, elm, balm of Gilead, fir, maple, birch, willow, spruce, tamarac (the American larch), cherry, basswood (the American lime-tree), pine, hazel, plum, thorn, and ironwood.

SINGAPORE.—According to the *Straits Times* of March 28, Singapore was then suffering from a water famine. Our old friend Mr. Meldrum calls attention to the editorial which says : "There can, we think, be little doubt that the rainfall has during the past few years been steadily decreasing, and it is believed this is owing to the extensive deforestation of the island of Johore, and of the Native States of the Peninsula." Urgent measures must be taken to prevent a total failure of the water-supply.

TIMBER SALES IN THE WEST RIDING, YORKSHIRE.—A correspondent of the *Timber Trades Journal* notes a slight improvement in the price given for Scotch fir, as much as 10d. per foot being given for fresh wood of large size. As much as 1s. 10d. per foot has been obtained for good ash ; while lots of clean elm trees, averaging from 40 to 60 feet each, have been delivered at 1s. per foot. Spruce fir was being readily parted with at 10s. 6d. per ton delivered. Irish beechwood could be obtained at a price per ton on trucks, which enabled it to be delivered within the Riding at a trifle over 1s. per foot to the consumer. Nice English or Irish sycamore wood brought 2s. to 2s. 5d. per foot ; smaller wood of the same kind, say from 3 to 10 in. quarter-girth, was offered at 1s. 1d. to 1s. 2d. per foot. Oak is dull, but English alder brought 1s. 3d. per foot. Planks of horse chestnut 11 to 18 in. quarter-girth, cherry tree 4 to 13 in. quarter-girth, and willow, were delivered at 1s. 6d. per foot.

FORESTRY IN THE HOUSE OF COMMONS.

BY A VISITOR ON THE 15TH ULT.

ALTHOUGH up till the last moment the course of business appeared to presage another postponement of Sir John Lubbock's motion, still the Hon. Baronet was fortunate to introduce an animated discussion in a fairly full House. The motion was for the appointment of a committee to consider whether, by the establishment of a Forest School, our woodlands could be rendered more remunerative. Sir John briefly, though emphatically, spoke of the opportune character of the present time for this, now that the head of the Indian Forest Service is at present in this country to aid the India Office in completing educational arrangements for his future officers. Dr. Lyons seconded the motion, adducing appropriate statistics on timber supply, advocating the supercession in many localities of tillage by arboriculture, and showing the disadvantages of a foreign training to Government forest service aspirants. On Sir Herbert Maxwell concluding a speech in support of the motion, by a somewhat amusing reference to the Prime Minister's tree-felling propensities, the latter exhibited the enthusiasm of the old man eloquent on this subject in a speech delivered with much vivacity. The Government, he said, would willingly accept the motion, but it must be clearly understood that they would not be committed thereby, in the slightest, as regards a grant for a School of Forestry in this country. Mr. Gladstone stated that there were two objections to that: the first, that we, in this country, do not depend so much on State aid as do our continental neighbours; and secondly, that there was not the same field for the practice of forestry in this as in other countries. In dealing with some of the favourable arguments, the Premier laid stress on the fact that although land agents were usually a very intelligent set of men, there were very few who had any knowledge of forestry. He also dwelt on the fact that landed proprietors lose a vast amount of money by not cutting their timber, and that whereas, in some parts of the country, there were men who could cut down trees beautifully and skilfully, there were other parts where there was the grossest ignorance on this score. (Surely Hawarden was not before the speaker's mind's eye.) Sir W. Barttelot followed in behalf of the motion, showing that in his district the systematic growth of underwood provided remunerative occupation for the poorer classes, at a time of year when work was scarce. Sir George Campbell, in supporting the motion, paid a high tribute to the labours of the Indian forest service; and said that the deplorable state of most of the trees in South Kensington Gardens, close at hand, was ample proof of the need of training in skilled forestry at home. In the eyes of Mr. Dawson, technical education was the great need of this country—and, specially to preserve our supremacy, a forest school.

So general was the concurrence of opinion in the House, that the motion was carried without a division.

EDINBURGH NEWS NOTES.

THE accounts of the International Forestry Exhibition, at length published, show a total income of £22,957, 9s. 8d., and an expenditure of £22,665, 15s. 8d., leaving a balance in hand, after paying all expenses, of £291, 14s. But as £300 was voted to publishing the memorial volume, already far advanced, only after all other claims had been met, the net amount to the good may be reckoned at £600. Such a result should encourage guarantors for the 1886 Edinburgh International Exhibition to come forward at once, so as to ensure its success. The successes of last summer were best seen in the admirable balance of £125 in an expenditure of £575 obtained by Colonel Michael in the Indian section. Such results show how a philosophy of successful educational showmanship of the most admirable character may be obtained.

RUMOURS as to the stability of the Californian Redwood Company prevailed throughout the winter. The public have now learned the truth of these, in the movements for liquidation recorded in the daily newspapers, and in the proceedings of the law courts. A loss of over half a million cannot but incite commiseration for the unfortunate shareholders. Pity 'tis that Edinburgh speculators in the lumber craft have in this and other like companies neglected the conditions of commercial success. More than a year ago, some of the American timber journals questioned the adaptability of the wood to many of the purposes for which it was said to be so well adapted, at the same time qualifying the unstinted praise which some had lavished on it to certain qualities of the wood. The best kinds may answer every expectation, but other sorts warp. Cabinet-makers here have found the wood more expensive to work than yellow pine, while it cannot as yet be sold more cheaply. Besides, some parties engaged in house-furnishing aver that the eye requires education, ere it likes the peculiar character of the cabinet work made from the wood. Altogether, apart from claims of the sellers of the 60,000 acres of forest giants now under the tutelage of Mr. Auldjo Jamieson of Arizona Copper Mine celebrity, successful commercial transactions in the wood here appear to imply such reductions in the charges of lumbering as will allow of a lower price being quoted. This after all, by cheaper means of transport and the like, may be practicable.

Tree-climbing plants, like the human parasites who hover round successful men, usually excite suspicion and dislike. But there may be uses other than their apparent ones for even such. Professor T. R. Fraser, at the May meeting of the Botanical Society, described the admirable properties in heart disease of *Strophanthus hispidus*, the source of the arrow poison of the natives of Eastern Africa. Professor Fraser's experiments with this new drug, very many times more powerful than *Digitalis*, or the common foxglove, appear to inaugurate a new era of hope to many new sufferers from a class of diseases apparently increasing with the march of modern progress. He gave great credit to Mr. John Buchanan, of Zomba, Eastern Africa, for his exertions in furnishing the necessary material.

Colonel Murdoch Smith is, I understand, on his way home from Teheran, to take the place vacant since the death of Professor Archer at the head of the Chambers Street Museum. No doubt the new Director's transmission of rare archæological finds from the East to South Kensington has influenced the authorities in this appointment. It adds another to the able group of specialists to the Edinburgh Museum, which as yet is lame in its department of archæology. Colonel Smith, who hails from Kilmarnock, is a son of the Church; and a notable example how the Competitive Examination system has in his case at least brought the ablest to the front.

Dixi.

HISTORICAL NOTICE OF SOME CELEBRATED TREES.[1]

PART I.—THE BAOBAB AND THE CYPRESS.

INDICES OF AGE.

THERE is scarcely any person who knows what a tree is who has not observed that the wood consists of concentric layers or rings, and that one of these layers is deposited every year. The bark also which surrounds the wood consists of the same number of concentric layers as the wood itself. That such is the structure and mode of growth in most cases, indeed in all cases except in the Palms and their allies, and which, therefore, we leave out of consideration, any one may readily convince himself. It affords a simple mode of ascertaining the age of a tree by counting the annual rings on a cross section of the trunk. It is true that in trees of slow growth and great age the zones are so crowded and so numerous that it is impossible to count them with accuracy, but when fairly deciphered we may rely on its correctness. But the venerable trunks, whose age we are most interested in determining, are rarely sound to the centre; and if they were, even the paramount interests of science would seldom furnish a sufficient excuse for cutting them down; so that this decisive test can seldom be practically employed, except in the case of comparatively young trees.

When such a section cannot be obtained, we are obliged to resort to other and less direct evidence, affording only approximate conclusions. Sometimes lateral incisions, not endangering the life of the tree, furnish the means of inspecting and measuring a considerable number of the outer layers, and of computing the age of the trunk from its diameter and actual rate of growth. But as young trees grow much more rapidly than old ones, we should greatly exaggerate the age of a large trunk, if we deduced its rate of growth from the outer layers alone. It is therefore requisite to ascertain by repeated observations the average thickness of the layers of young trees of the same species, and by the judicious combination of both these data, a highly probable estimate may often be obtained. When unable to inspect any portion of the annual layers of remarkable old trees, we may occasionally have other indications upon which some reliance may be placed: such as the amount of increase in circumference between stated intervals; but, on the one hand, we can never depend on the entire accuracy of two measurements made at widely distant periods, and, on the other, the growth of a small number of years, however carefully ascertained, would be an unsafe criterion, so that this method can seldom be employed with much confidence. A more common mode, therefore, is to employ the average rate of growth of the oldest trees of which complete sections have been examined, for the approximate determination of the age of remarkably large trunks of the same species, when the size alone is known; for repeated observations prove that the increase is greatest (that is, that the layers are thickest) in young trees; but that afterwards—say, after the first century—the tree increases in diameter at a much slower, but somewhat uniform rate, which does not greatly vary in different trees of the same species. Such estimates, therefore, would always tend to underrate, rather than to exaggerate, the age of a large tree. But it is really unsafe to apply this method except to truly venerable trunks, for the growth of a tree is liable to great variations during the first century or two; either from year to year, or between different individuals of the same species. The influence of a stratum of soil, or the injury of a single leading root or branch, may affect the whole growth of a young tree for a series of years, while in an older individual the wide distribution of the roots, and multiplication of the branches, render the effect of local injuries nearly unappreciable, and the influence of any one or more unfavourable seasons is lost, in the average of a great number. But more commonly, perhaps, our estimates rest, either wholly or in part, upon historical evidence or tradition; and in Europe many trees, especially chestnuts, lime-trees, oaks, and yews, may be satisfactorily traced by records throughout several centuries.

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[1] From a MS. of the late Professor Walker Arnott, M.D., who for many years occupied the Chair of Botany in Glasgow University.

Having thus indicated the kinds or sources of evidence which are brought to bear with more or less directness and force upon the age of trees, I now offer an account of some of the more remarkable or curious cases that have been noticed.

THE BAOBAB.

The Baobab or monkey-bread, *Adansonia digitata*, has long afforded the most celebrated instances of vegetable longevity: Humboldt indeed calls them "the oldest organic monuments of our planet." They are not uncommon on the western coast of Africa. The tree is remarkable for the small height it attains, compared with the immense diameter of the trunk and length of its branches. Trunks which are 70 or 80 feet in circumference rise to the height of only 10 or 12 feet, when they divide into a great number of extremely large branches, 50 or 60 feet long, which, spreading widely in every direction, form a round verdant mass perhaps 150 feet in diameter, and only 70 feet in height. The roots likewise are of vast length: one of these, laid bare by a torrent which had washed away the earth, was traced to upwards of 110 feet without reaching the extremity. To these peculiarities, rather than to the nature of the wood, which is light and soft, the great age to which the tree attains may probably be traced. Its form opposes an effectual resistance to the tempests which would overthrow ordinary trees. The history of these Baobabs, possibly of the very trees which Adanson's account has rendered famous, reaches back to the discovery of the coast of Senegal and of the Cape de Verde Islands, by Cadamosto, in 1455, who in his narrative mentions the singular disproportion between the height and girth of these trees. But they were first fully described by the French naturalist Adanson, who examined them scarcely a century ago. The largest trunks measured by Adanson were 85 feet in circumference, or 27 feet in diameter. Golberry is said to have measured one that was more than 100 feet in girth, and M. Perrottet in 1824 met with many Baobabs in Senegambia varying from 60 to 90 feet in circumference, yet still in a green old age, and showing no signs of decay; but, on the contrary, if wounded in the smallest degree, they exuded a copious sap. There can therefore be no doubt respecting the prodigious size which these trees attain, and there is great reason to suppose that Humboldt was right in supposing them to be the oldest in existence. As to their actual age, the narrative usually given is the following. Adanson observed in 1749, at the Madelaine Islands, near Cape de Verde, some Baobab trees of 30 feet in diameter, upon the trunks of which he found inscriptions that had been made three hundred years before by two English travellers; that by cutting through 300 annual layers, he discovered the vestiges of these inscriptions upon the wood, thus proving that they were actually made at the date assigned; that by measuring the thickness of these layers he was enabled to judge of the rate of increase during the last three centuries; that having thus obtained the rate of increase in old age, and having by actual inspection of young trunks, learned the rate of growth during the first hundred years, he deduced from these combined data the almost inevitable conclusion that the trees in question were five or six thousand years old. In most accounts of the tree, the following table is also given as if drawn up by Adanson:—

At	1	year old it was	1 to $1\frac{1}{2}$ inch diam.,	and	5	feet high.
„	20	„	1 foot	„	15	„
„	30	„	2 feet	„	22	„
„	100	„	4	„	29	„
„	1000	„	14	„	58	„
„	2400	„	18	„	64	„
„	5150	„	30	„	73	„

Nothing of this kind, however, was ever published by Adanson. His first account, which comprises all the principal facts, is given in the *Voyage au Sénégal*, prefixed to his volume on the natural history of that country, and published soon after his return to France in 1753. Adanson simply relates that on his visit to the Madelaine Islands, he found Baobab trees of 5 or 6 feet in diameter, which bore European names and dates deeply engraven on the bark. Two of these he took the trouble to renew, one of which was dated in the fifteenth, the other in the sixteenth century. The characters were about 6 inches in length, and as in breadth they occupied but a small part of the circumference of the trunk, Adanson reasonably inferred that they were not engraven in the early youth of these trees. He had previously seen in the island of Senegal trees of the kind, which were 63 and 65 feet in circumference; but he does not intimate that he inspected the layers of wood in any case. He merely remarks that these inscriptions might furnish some evidence respecting the age which the Baobabs sometimes attained: "For (says he) if we suppose that the inscriptions were engraven even in the early years of these trees, and that they have grown to 6 feet in diameter in the course of two centuries, we may calculate how many centuries they would require to attain the full diameter of 25 feet." Soon afterwards Adanson communicated to the Royal Academy of Sciences at Paris a full account of the Baobab, which was published in their *Memoirs* for the year 1761; and lastly, he wrote the article "Baobab" for the supplement of the great *French Encyclopædia*, published in the year 1776. These accounts, although more detailed, embody no essential additions to what had been already given. He says that the trees in question were two in number, upon the bark of which the names of Europeans were engraved, with dates, some posterior to the year 1600; and others, as far back as 1555, were probably the work of those who accompanied Thevet, who in his voyage to Antarctic lands saw some of these trees that same year on a small island close to the Cape de Verde. Some of the dates appeared to be previous to 1500, but these were somewhat equivocal. Neglecting therefore the indistinct dates in the fourteenth century, continues Adanson, and even allowing that the inscriptions were made when the trees were very young, which is highly improbable, as they occupied less than an eighth of the entire circumference, it is evident that if the Baobab has attained 6 feet in diameter between 1555 and 1749, that is in two hundred years, it would require more than eight centuries to attain the diameter of 25 feet, supposing the growth to continue at a uniform rate. But Adanson goes on to say, that trees grow the more slowly as they advance in age, so that such an estimate would fall below the truth. As to its rate of growth when young, he states that the tree acquires the diameter of 1 inch or $1\frac{1}{2}$ inch in the first year, the diameter of 1 foot in ten years, and about $1\frac{1}{2}$ in thirty years, which certainly agree pretty well with the table I have just spoken of; but so far from having extended these data, and employed them in the manner which is attributed to him, he says that although it might be desirable thus to employ them, a good knowledge of geometry teaches that they are quite insufficient for that purpose. Hence, instead of attempting any precise determination, he merely offers the *probable conjecture* that these largest Baobabs may have been in existence for several thousand years, or nearly from the period of the universal deluge. The table has been so often published in the encyclopædias in this country, as well as in foreign works of great authority, that I have considered it necessary to point out to you at some length the uncertainty regarding its authenticity. I believe it was actually drawn up by Duchesne, a French writer on forest trees, since the commencement of the present century, his only data being the observations of Adanson on trees up to the age of thirty years, and his supposition that the largest ones might have been coeval with the deluge—from these the intermediate years were intercalated.

But as already said, whatever doubts may be entertained as to their actual age, there is a strong presumption in favour of their being the most ancient living monuments in the world. On the western coast of Africa this tree is very liable to be attacked by *fungi*, which prey upon its heart-wood, and without changing its colour or general appearance, destroy the life of the plant, and render its timber very soft. Trees thus destroyed are hollowed out as *mausolea* or burial-places, to receive the dead bodies of physicians and magicians, and such other persons who, from their skill, are presumed by the superstitious natives to hold communion with evil spirits, and are therefore denied the common rites of sepulture. The bodies suspended in these chambers become dry and are well-preserved, like mummies, and are called in the language of the country *Guiriots*.

THE CYPRESS.

We shall now turn our attention to the deciduous Cypress or *Cupressus disticha*, a native of the southern states of North America and of Mexico, in which latter country it attains its most ample development. It grows generally in water, or in low flat lands, near the banks of great rivers and lakes, that are covered great part of the year with 2 or 3 feet depth of water; and that part of the trunk which is subject to be under water, and 4 or 5 feet higher up, is generally enlarged by prodigious buttresses or pilasters, which, in full-grown trees, project out on every side to such a distance that several men might easily hide themselves in the hollows between. Each pilaster terminates under ground in a very large, strong serpentine root, which strikes off and branches every way just under the surface of the earth; and from these roots grow woody cones, called Cypress knees, 4, 5, and 6 feet high, and from 6 to 18 inches and 2 feet in diameter at their bases. The large ones are hollow, and serve very well for beehives. A small space of the tree itself is hollow, nearly as high as the buttresses already mentioned. From this place the tree, as it were, takes another beginning, forming a great straight column, 80 or 90 feet high; when it divides every way round into an extensive, flat, horizontal top, like an umbrella, where eagles have their secure nests, and cranes and storks their temporary resting-places; and what adds to the magnificence of their appearance, are the streamers of long moss that hang from the lofty limbs, and float in the winds. In favourable situations this tree sometimes attains the height of 120 or 140 feet, and a circumference of from 20 to 40 feet, when measured quite above the singularly dilated base. Michaux measured one in the United States, the trunk of which was 40 feet in circumference, or 12$\frac{3}{4}$ feet in diameter, above the conical base, which was three or four times greater still. A tree of this kind in the gardens of Chapultipec, in Mexico, is called the Cypress of Montezuma, because it is said to have been already a remarkable tree when that unfortunate Prince was on the throne in 1520, or three and a quarter centuries ago: it still retains all the vigour of youthful vegetation. According to Mr. Ward, the girth of the trunk is about 41 feet; Mr. Exeter, however, makes it 45; but the height is so majestic as to make this enormous mass appear light and graceful. Another tree in the same neighbourhood was 38 feet in circumference. But these are greatly surpassed by one at the village of Atlisco, in the intendancy of Puebla, which was first described by the Archbishop Lorenzana. He states that the cavity of the trunk, for the tree is hollow, might contain twelve or thirteen men on horseback; and that in the presence of the Archbishop of Guatemala and the Bishop of Puebla, more than a hundred boys entered it. According to Humboldt the girth of the trunk is upwards of 23 metres, or 76 English feet, and the diameter of the cavity about 16 feet. But a still more gigantic Cypress is that which stands in the churchyard of the village of Santa Maria del Tule, in the intendancy of Oaxaca, 2$\frac{1}{2}$ leagues east of that city, on the road to Guatemala by the way of Tehuantepec. In its neighbourhood there are five or six other trees of the kind, which are nearly as large as the Cypress of Montezuma, but which this one as much surpasses as that does the ordinary denizens of the forest.

Humboldt, on the authority of his informant M. Anza, states the trunk to be 36 metres, or 118 English feet in circumference; and a more complete account of it has been given by Mr. Exeter, according to whom it is 46 *varas*, or 122 English feet, which indeed differs very little from Humboldt's measurement. In neither case is it said at what height above the ground the trunk was measured. But M. Galeotti, who visited it in 1839 and 1840, again measured it carefully, and found the circumference of the trunk at the height of 4 feet above the surface of the soil to be 105 French feet or 112 English feet. The previous measurements must therefore have been taken somewhat nearer the base. The tree is about 120 feet high, and as yet shows no signs of decay—there is not even a single dead branch on it—although it bears less foliage in proportion to its size than its younger companions. It is an object of great veneration with the natives of the village and the neighbouring Indians, who in former times, it is said, offered sacrifices to it. Mr. Exeter states that it is mentioned by Cortez in his history of the conquest of Oaxaca, as at that time the greatest wonder he had seen, and the shade of which sheltered the whole of his little army of Europeans from the intolerable heat of the sun; of this, however, there are some doubts, the Cypress passed by Cortez on the march to Mexico being a different one, which is still traditionally associated with his name. The enormous branches that spring out of the trunk, some 30 feet high, make it appear (as several other smaller ones in the neighbourhood also do) as if there were three or four trees united, although as one entire bark encircles the grand trunk, there is little doubt of its being a single tree. Mr. Exeter reports, and the observations of recent travellers to some extent confirm the statement, that there are Cypresses near the ruins of Palenqué, equal in size to the tree at Sante Maria del Tule. Such may indeed claim a much higher antiquity than the very ruins they overshadow. They must have witnessed the rise, the flourishing existence, the decline, and the final extinction of a race whose whole history has sunk into oblivion; of it, it may almost be said:

> "Its cold and lengthened tracts of shade
> Rose on the day when sun and stars were made."

But the real age is unknown. De Candolle, by ascertaining the rate of growth of the same tree in France during half a century, conjectured that the American trees, in their early days, increase at the rate of about 1 foot in diameter every fifty years; and this rate is quite as high as American observers allow for those grown in the forests of the United States, but it seems much too low for trees planted in open favourable situations. This rate, however, would give to the Cypress of Montezuma the age of about seven centuries, and would render that at Oaxaca about as old as the commencement of the Christian era. But old trunks, we have already observed, increase much more slowly as they advance in age, so that the rate of growth assigned can in no way apply to them. Indeed there can be no doubt but a much higher antiquity must be assigned to them, and therefore the trees of Atlisco and Sante Maria del Tule can scarcely, as De Candolle remarks, be less than 4000 years old, and may possibly be nearer 6000. It is to be regretted that no traveller has made one or more lateral incisions into one of these old trees, which might be done without injury to its vitality, and thus the actual growth for a few of the last centuries could be ascertained. This, combined with the growth of a young tree, would afford much better data than we have at present for these, some of which probably date their existence as far back as the actual creation of the world.

The classical Cypress, *Cupressus sempervirens*, belongs to the same genus as the last. The variety which is called the common or spreading Cypress, is a valuable timber tree, the wood being supposed to be the most durable, superior even to that of the cedar. The doors of St. Peter's Church at Rome, which had been formed of this material in the time of Constantine, showed no symptom of decay when, after the lapse of 1000 years, Pope Eugenius IV. took them down to replace them by gates of brass. The Athenians buried the remains of their heroes in coffins of cypress, and the chests or coffins in which Egyptian mummies are found, are frequently of this timber. For building there is none superior, as it is almost as durable as stone itself. It has always been a favourite in gardens, and is reputed to be one of the longest lived trees of southern Europe and of the East. Hunter, in his edition of *Evelyn*, about a century ago, mentions the fine avenue of cypresses, which bear the name of the "Cypresses of the Queen Sultana," in allusion to an anecdote relative to a Sultana who was accused of having made an assignation under them with an Abencerage, in consequence of which, according to the legend, thirty-six princes of that race were massacred. They are, indeed, well known to have been in the garden in the reign of Andelá, the last of the Moorish kings. Now the Moors were expelled from Spain in 1492, and according to Mr. Webb, who visited them in 1831, these enduring memorials of frailty and revenge are still flourishing. Well, supposing them to have been only forty or fifty years old at the occurrence of the event to which they owe their celebrity, they have now reached the age of about 400 years, but in all probability they are much older. Of these trees I am not aware that there exist any authentic measurements, but they are by all allowed to be very much smaller than one at Somma in Lombardy. This is greatly reverenced by the inhabitants of the district, who have a tradition that it was planted in the year of our Saviour's birth. Even Napoleon is said to have treated it with some deference, and to have deviated from a direct line, when laying down the plan for the great road across the Simplon, in order to avoid injuring it. Millin states that in 1794 the trunk was *at least* 16 feet in circumference. But according to the Abbé Belèze's measurements, the girth in 1832 was 20 feet, and Signor Manetti states that at that time it was 23 feet in circumference at the height of a foot from the ground. Now well-authenticated observations proved that the Cypress scarcely attains the circumference of 14 or 15 feet in 400 years, and that after that it increases very slowly, so that Millin's measurement may be taken as considerably below the truth. Perhaps then some credit may be placed in the popular tradition; indeed, Abbé Belèze informs us, on the authority of his brother, that there is an ancient chronicle extant at Milan, which proves this tree to have been in existence in the time of Julius Cæsar!

THE LATE T. C. ARCHER, DIRECTOR OF THE MUSEUM OF SCIENCE AND ART, EDINBURGH.[1]

BY A. GALLETLY.

THOMAS CROXEN ARCHER was born in Northamptonshire in the year 1817, and was educated in London as a surgeon, but does not appear to have practised for more than a few years. He received an appointment in the Import Department of the Customs, at Liverpool, in 1841, and remained in the service for nineteen years. Having a natural taste for botany, he took a special interest in the vegetable products which were brought to that port from all parts of the world. He formed an extensive collection of Liverpool imports for the Great Exhibition of 1851, and it was this which first brought him into public notice. While other public-spirited men at Liverpool were at a loss to know what to send to the Exhibition, Mr. Archer had the shrewdness to see that nothing would show the greatness of the town better than a correctly-named series of specimens of the raw products—mineral, vegetable, and animal—which, at one season or another, were floating in the famous docks on the side of the Mersey.

In 1853, Mr. Archer wrote a small volume on *Economic Botany* for the well-known series of popular works on Natural History, published by Reeve & Co., London. It is illustrated with coloured plates by Fitch. This book contains, in small compass, much useful information on the botanical sources of imported fruits, nuts, and oil-seeds; starches and gums; textile fibres; dyeing and tanning materials; building and furniture woods; and some medicinal products. About this time, Mr. Archer had a good deal of correspondence with Sir William Hooker, who was then forming the fine Museum of Economic Botany at Kew. A few years later a collection of the same kind, though smaller in scale, was got together by Mr. Archer, at an astonishingly small expense, in connection with the Royal Institution, Liverpool. He also took a particular interest in the Botanic Garden of that town, his liking for exotic being stronger than for British botany. He was fond, however, of making botanical excursions to country districts in Lancashire, Cheshire, and North Wales. He was appointed Professor of Botany in Queen's College, Liverpool, in July 1857; but this College does not appear to have been continued as an educational institution for more than a few years afterwards.

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[1] Forming part of an obituary notice read to the Botanical Society of Edinburgh.

Professor Archer was appointed Director of the Edinburgh Museum of Science and Art in May 1860. He brought with him from Liverpool his private collection, which consisted of fully two hundred specimens, chiefly of vegetable products used in the arts. These mainly consisted of the same substances which he had obtained for the collection of imports for the Great Exhibition, most of those of vegetable origin being described in his book. As fully a quarter of a century has elapsed since these specimens were collected and the extent to which they were used recorded, it may be curious to note what changes have taken place in the relative importance of some of them. Madder roots were then, and had been for centuries, a most important article of commerce, as they furnished one of the most largely-used dyes; but soon after the discovery of the aniline colours by Perkin and others, madder became less used than it had been, and the subsequent discovery of an artificial method of making alizarin—the colouring principle of madder—has reduced the imports of natural madder to comparative insignificance. Indigo, another dyestuff of great importance, still figures conspicuously among our imports; but its colouring principle has also been recently prepared artificially—that is, from other sources than the indigo plant—by German chemists; so that, although the artificial product is still too costly to compete with the natural indigo, the cultivation of the plant and the preparation of the dye from it may soon be no longer remunerative.

Palm-oil, obtained so abundantly from the fruit of the palm *Elais Guineensis*, and the use of which for the manufacture of soap and candles as well as for lubricating, goes nearly back to the time—fully fifty years ago—when Chevreul completed his researches on the nature of fixed oils and fats, is yielding in importance for two, but more especially for one, of these purposes, to the products of our native oil shales and the oil wells of North America. Candles can now be made more cheaply from paraffin than from palm-oil, and the former has also the advantage in price for some lubricating purposes. Oil from the seed of the cotton plant, which was little more than a curiosity a quarter of a century ago, has become a material of much commercial importance.

Gutta-percha, which has now been known in Europe for forty years, and which was at one time on its trial as a material for numerous ornamental purposes, and for a still greater number of articles of domestic use, from curtain rings to whole ceilings, from drinking mugs to water pails, from coating of wires to drain pipes, and from sailors' hats to boats of serviceable size,—has turned out, from its tendency to rot, to be a substance of comparatively limited application. India-rubber, on the other hand, has become so extensively employed in the arts, that some anxiety exists as to the keeping up of the supply. The imports of this material in the year 1883 amounted in value to the enormous sum of £3,650,000.

One of the minor vegetable products turned to useful account is the nut of the vegetable ivory palm, *Phytelephas macrocarpa*, which grows in the low valleys of the Peruvian Andes. This material has a considerable resemblance to ivory, and, when Mr. Archer wrote his book, it was to some extent turned or carved into small trinkets in England. It is still used for this purpose, but of late years vegetable ivory has almost completely displaced all other substances for the buttons of tweed clothing; so that these are now made in enormous numbers in Birmingham. They are, of course, stained or dyed to suit the fabric.

With respect to textile materials, cotton still stands far at the head of all others in importance. Flax and hemp maintain their place as staple fibres. The strong and beautiful China grass or Rheea fibre, from *Bœhmeria nivea*, bade fair at the time of the first Great Exhibition to figure soon as a conspicuous article of commerce, but, in spite of handsome rewards more than once offered by the Indian Government for a means of preparing it economically, the problem has not yet been solved, so that it is still far from being extensively used. The imports of jute, on the other hand, have in the same period of time risen to gigantic proportions.

The so-called New Zealand flax, *Phormium tenax*, is another plant whose fibre, it was at one time supposed, would come largely into use for ropes, cordage, and some kinds of cloth; but though possessing some valuable properties, it has not yet, except on a very small scale, been cultivated, and even the wild plant which grows abundantly on hillsides in New Zealand is not gathered. Manilla hemp from *Musa textilis,* and coir fibre from the husk of the cocoa-nut, are, however, textile materials which have become of much importance. We need only further refer to Esparto or Spanish grass, which, till about the year 1860, had scarcely been thought of as a material for papermaking, but is now annually imported for that purpose to the extent of 200,000 tons, the value of which amounts to nearly £1,400,000.

Along with Mr. Peterson, of the office of Crown Domains, St. Petersburg, Professor Archer wrote an elaborate official report on the vegetable substances used in manufactures shown in the International Exhibition of 1862. In this report detailed lists are given of the exhibited woods from several countries, which appear to have been collected and named with skill and care. The Spanish list contains the comparatively large number of 312 indigenous and acclimatized woods. Mr. Archer refers to the work of examining the numerous specimens of gums, resins, gutta-percha, and caoutchouc shown, as being particularly laborious. He acted as an Associate Commissioner at the Paris Universal Exhibition of 1867 for the class dealing with Forest Products; and was again at work at the Vienna Universal Exhibition of 1873, and wrote several reports for the British Commission in connection with it.

Professor Archer was British Commissioner conjointly with Colonel Sandford at the Philadelphia Exhibition of 1876, and while there, notwithstanding heavy official duties, had some opportunities of studying the botany of the United States. He was much gratified when at Philadelphia with the opportunity, which, as one of the high officials of the Exhibition, he enjoyed, of tasting the native grown tropical fruits of the Southern States, of the West Indies, and even to some extent those of South America.

Of late years he spent most of his leisure time in his garden, and took great delight in examining any specially fine or interesting plants in conservatories belonging to his friends, as well as in looking over the beds of Alpine flowers in their grounds.

In private life Mr. Archer was much esteemed by his associates. He had attractive powers of conversation, had travelled much, and was altogether a very entertaining companion. In his official work he was very active and energetic, and did everything he could to extend the usefulness of the Museum; but at the same time he was considerate and kind to his subordinates, and solicitous at all times for their welfare.

SETTLING IN BRITISH COLUMBIA.

BY A LUMBERMAN'S WIFE.

DURING the night of the 27th of March 1884, after a 60 hours' sail from San Francisco in the Canadian Pacific steamship *Mexico,* we rounded Cape Flattery and entered the Straits of San Juan de Fuca. It was our intention, if circumstances proved favourable, to make our home in the province of British Columbia; and it was, therefore, with more than the ordinary interest of tourists, and with hopeful expectation, that about 6 A.M. on the morning of the 28th we opened the door of our cabin and stepped on deck. For three days we had been gazing at the "waters wan" of a northern sea, and on Saturday night we fell asleep tired with watching the unbroken line of the distant American coast. But on Sunday we awoke to find ourselves in an earthly paradise, that surpassed in loveliness anything that we had before even dreamt of or imagined. The scene that met our eyes was one of extreme beauty. On our right hand, as we steamed slowly up the Straits, we had the snow-covered range of the Olympian Mountains, apparently rising out of the blue water. On our left were the green fir-clad hills of Vancouver Island, their dark outlines showing distinctly against the bright blue background of the sky. The more distant landscape before us was at first hidden by a light haze, which the sun gradually dispelled, revealing a wider expanse of water, and then, farther away on the mainland, the isolated snow peak of Mount Baker. The dark fir hills of the island had an aspect of undisturbed restfulness, which charmed us by its contrast with the glittering ripples of the Straits and the dazzling brightness of the mountains. The Olympians form a long, continuous range, and, rising directly from the sea-level, they impress one as more lofty and majestic than their height, which varies from 4000 to 6500 feet, would lead one to expect. Mount Baker, in Washington territory, is between 10,000 and 11,000 feet high.

At Cape Flattery a pilot had been taken on board, and under his guidance we sailed slowly up the Straits, keeping at a sufficient distance from the Vancouver shore to avoid the low line of rocks that stretch far out into the water, and are known as the Cape Race rocks. After passing the Cape Race lighthouse, we were told that we were in sight of Victoria; but that meant that Victorians, who were on the look-out, could see us. The only signs of man's habitation that *we* could see were a few scattered farm-houses along the shore, half hidden by the thick forest surrounding them. Presently, however, we noticed a faint cloud of smoke hanging over the land at some little distance from the coast, and as we slowly drew nearer and nearer, this still remained the only sign of the town that we could see. Then we passed the fine spacious harbour of Esquimalt, where the largest ships can enter at all times, and then the low rocky promontory that separates it from the Victoria Inlet. The Victoria harbour is not easily accessible, for it is entered through a narrow winding channel half a mile or more in length, but its bare rocky shores were preferred by the early settlers to the thickly-wooded land that surrounds Esquimalt.

During the past year or two a great many young Englishmen have arrived in the province. Those of them who have been trained in business habits, and command some capital, do well. The young men of good family, for whom no fitting career presents itself at home, and who come out with a few hundred pounds in their pockets, and with vague ideas of farming or cattle-raising, are often much disappointed with the realities that meet them. British Columbia is not an agricultural country. It will always be cheaper to import wheat and other grain from the great prairies of the North-West territory than to grow them here. It has been described as "a sea of mountains." In these mountains are hidden vast treasures of coal and iron, which will prove a backbone of strength in the future. But at present the "You know what I mean, don't you know?" young man hopelessly confronts them. Among these mountains, and closely shut in by them, are high valleys, or tablelands, of park-like character, which are admirably adapted for cattle ranches. But these are 10 or 12 days' journey from the railway line, and the traveller along the Frazer knows nothing of them. The cultivation of fruit, at a point as near the Rocky Mountains as is practicable, probably offers the most promising chance to the man of small capital. Victoria is well and cheaply supplied with fruit from California; but fruit-growers on the mainland will have the whole of the North-West territories as far as Winnipeg thrown open to them as a market by the Central Pacific Railway. But, alas! the working man, whose family in the busy season will rise with the dawn and help all day with the tedious work of gathering in the fruit, has again the pull over the gentleman.

The timber lands of British Columbia are valuable and extensive, and the lumber trade is already of large dimensions. Besides the various sawmills supplying the local demand, which have lately been greatly increased by the construction of the Nanaimo and Esquimalt Railway, there are two mills on the mainland coast which carry on a large shipping business.

The canning of salmon, chiefly for exportation to England, has not been very profitable for the last year or two. The supply has outrun the demand. If a method could be adopted by which *whole* salmon could be successfully canned, there would be great hope for the revival of this industry.

About 75 miles to the north of Victoria, on the coast, is Nanaimo, a mining town in the centre of a great coal district. The most important mines that are at present worked in British Columbia are at Wellington, six miles from Nanaimo. An island railway which should connect Victoria and Nanaimo, and facilitate communication with the Central Pacific Railway terminus on the mainland has long been talked of, and last summer the country was surveyed for this purpose, and the line projected. The railway is being constructed by a syndicate, composed chiefly of American capitalists, but with Mr. Robert Dunsmuir, of this province, the proprietor of the Wellington coal mines, as president. The chief engineer of the line is Mr. Joseph Hunter, whose father laid out the grounds of Balmoral, under the supervision of the late Prince Consort. The contracts for clearing and making the roadway have all been given out, and it is expected that the line will be open for traffic within two years. A line of steamers is certain to connect Coal Harbour, on the mainland, either with Nanaimo or Chemainus on the island coast; and it will then be seen whether Victoria will retain her pre-eminence in the province, or whether for business purposes she will be superseded by Vancouver, as the Pacific terminus of the Central Pacific Railway has been named. Her natural position and her climate will always make Victoria the favourite place of residence. She is styled a "city of homes" by her American neighbours. There are but few houses of any pretensions to size or magnificence in the rambling suburbs; but spacious one-storeyed cottages, with verandahs, overgrown with honeysuckle and trailing roses, have hitherto been the favourite dwelling-houses. The difficulty of getting domestic help has probably been one cause of their popularity; but for beauty and picturesqueness the commonplace villas which are now being built cannot compare with them. However, I must not abuse the villas, for one of them has been converted by us into a very pleasant home.

The climate of Victoria resembles that of the south of England. When we arrived in March, crocuses, snowdrops, and daffodils were blooming in the gardens, and the smell of sweet violets filled the air. Within a month the cherry and then the apple trees were in blossom, and there was scarcely a corner of the town where they were not to be seen. Sweetbriar and wild dogroses covered every old fence, and overran the sides of the gutters. Only for a fortnight in August was the heat too great for walking to be pleasant. However warm the day, a cool southern breeze, blowing across the Olympians, would rise about four o'clock P.M.; while there were few evenings in which a wrap of some kind was not acceptable. The snow did not vanish from the Olympians before August. When everything in Victoria was covered with frost and snow, and even the dark fir trees were stretching out white feathery branches, the distant mountains alone remained dark and sombre. And now that spring has come again, and flowers are once more filling the gardens with perfume, the Olympians have donned their white raiment, and they too look fresh and delicate, and dazzlingly fair in the sunshine. One feels that among them, if anywhere, must be

> "The island valley of Avilion,
> Where falls not hail, or rain, or any snow,
> Nor ever wind blows loudly."

If the summer evenings are colder, the winters are, on the whole, less severe than in England. There are heavy rains in the autumn; and last December we had what was regarded by the older inhabitants as an exceptionally cold "snap." For a fortnight the thermometer registered from eight to fourteen degrees of frost, and this was intensified by the north wind which found its way into every corner of the slightly-built frame-houses. Every morning the cream in the pantry, the water in the filter, and even the beer had to be thawed; while our China boy put on every day some additional article of clothing, until he more nearly resembled a tea cosy than anything else. But this state of things, happily, did not last long. In January and February we had mild, moist weather, with showers of rain every day; then spring burst suddenly upon us.

A year has passed away since we landed at the Outer Wharf on that lovely Sunday morning in March. England now does not seem to be so far distant from us as Vancouver Island to our friends at home. Indeed, a young Englishman assured me that one of the advantages of Victoria is that it is not "shut off" from the world, or from what has hitherto made our world. "It is only twelve days from London," he continued, speaking as we should have done a year ago of a country place in Surrey or Kent, connected by hourly trains with town. This young fellow's ideas are somewhat ahead of his time, no doubt. Nevertheless the day is approaching when the wonderful power of steam will practically annihilate distance. At any rate, within a few months we shall be able to travel from Vancouver Island to England without setting foot on foreign soil.

VICTORIA, *April 5.*

THE DEBATE ON SIR JOHN LUBBOCK'S MOTION.

AFTER several postponements, Sir John Lubbock's opportunity came on the 15th May. Before going into Committee of Supply, he moved the House of Commons for a Committee to inquire if, by the establishment of a Forest School, our forests and woodlands could be rendered more remunerative. He said that, as last year he had the opportunity of addressing the House on the subject, he would not trespass long on their indulgence. The subject was one of considerable importance. England was almost the only country without a Forest School. Such institutions existed in Prussia, Saxony, Hanover, France, Switzerland, Austria, Sweden, Spain, Russia, and, in fact, in almost every other country. The need for a Forest School in England had by no means reference only to the State forests. There were some 2,800,000 acres under wood, while in the colonies the forests were estimated to cover no less than 340,000,000 acres. In fact, our interests in this respect were larger than those of any other country in the world. He would only give two instances out of many which might be quoted to show how much might be effected in this direction. Thirty years ago the Landes was one of the poorest and most wretched regions in France. It had been judiciously planted, and was now one of the most prosperous. The increase of value was estimated at no less than £40,000,000. In India fifteen years ago the net forest revenue was only £52,000, while since the establishment of a Forest Department it had risen to over £400,000, which, of course, would represent an immense increase in capital value. Competent authorities had estimated that there were over 5,000,000 acres of land in this country which might be planted with advantage. M. Boppe, one of the greatest French authorities, had recently visited this country on behalf of the India Office, and clearly indicated his opinion, though he expressed it as courteously as possible, that we were behind other countries in the management of our woodlands. Our own highest authorities were of the same opinion. Mr. Brown, in his standard work on Forestry, said that "if our woodlands had been judiciously managed we should not find so great a part of the woodlands of Great Britain in the unprofitable state in which they are." Mr. Cruikshank, in his *Practical Forester*, said that "nothing was more common than to see trees planted in situations for which they were utterly unsuited," and he gave many illustrations. The *Journal of Horticulture* said that "it is little less than deplorable to witness the miles of woods that are practically valueless from a commercial point of view, whereas, under skilled supervision, they might yield a substantial revenue to their owners, and in addition be an advantage to the trading and agricultural community." And the same view has been ably advocated by the *Journal of Forestry*. At a recent meeting of the Convention of Royal and Parliamentary Burghs of Scotland, held in Edinburgh on the 8th of April last, on the motion of the Lord Provost a unanimous resolution was adopted in support of the motion which he had the honour of moving. Indeed, so necessary was a scientific training, that the officers intended for the Indian Forest Service were sent to study at Nancy. No doubt that was an admirable institution; but, naturally enough, it was specially adapted to French requirements. For instance, one of the subjects was French law; again, of course, French technical terms were used. The India Office proposed, he believed, that a part of the course should in future be passed at Cooper's Hill, but that the students should spend some time in France to study the practical part. That, of course, was an acknowledgment, first, of the advantage to be derived from systematic training, and, secondly, that such advantage could not be procured in this country. He was informed that, the West Indies having recently applied to the Colonial Office for some one to advise them on their forest management, it had been impossible to find any person in this country competent to do so. The Cape of Good Hope and Cyprus had also been compelled to entrust their forests to foreigners. They were indebted to the hon. member for Dublin for several interesting reports on forest management; but he would leave his hon. friend to deal with them. The present was a favourable time for the inquiry, because Dr. Schlieb, the head of the Indian Forest Service, was now in England, and he believed that this was also the case with his predecessor, Dr. Brandis. This was not a case, he thought, which could be left altogether to private enterprise, because a Forest School necessarily required access to a considerable area of forest. He did not, however, wish to commit himself to the establishment of a Government school; he thought it at least worthy of consideration whether some intermediate system might be adopted which would enable some one or more existing institutions to benefit by the national forests. At present, the landed interest was so greatly depressed that we ought not to neglect any step by which its condition might be improved. To show the demand for timber, he reminded the House that our annual import was about £16,000,000. He believed that the average income derived from woodlands might be substantially increased. Moreover, it was desirable that the whole question should be investigated, before the Government committed themselves to a new system of training for the Indian Forest officials. He trusted, therefore, that Her Majesty's Government would consider that he had made out a strong case, at any rate, for inquiry, and that the House would accede to his motion. In conclusion, he begged to move for a Select Committee to consider whether by the establishment of a Forest School or otherwise our woodlands could be rendered more remunerative. (Hear, hear.)

Dr. LYONS, in seconding the motion, reminded the House that he had for some years past called attention to this subject in connection with Ireland. It was undoubtedly the case that of late years a very considerable diminution had taken place in the amount of wood planted. Ireland had formerly been able to carry on a large amount of iron-smelting by means of her wood, and the smelting had come to an end when the supply of wood had ceased. He had to thank the noble lord the Under-Secretary for Foreign Affairs and the noble lord the Secretary for the Colonies for the ready assistance which they had given him in investigating the important subject of forestry. In reports, which included the greater portion of Europe, it was clearly laid down that those countries could no longer afford to export an unlimited amount of timber to this country. It was the same with regard to the United States and to Canada, where the timber had been recklessly cut down, and where constant forest fires destroyed as much timber as would have supplied European demands for some years. The hon. member for London University had referred to our timber imports as amounting to £16,000,000. That return, he thought, must refer to timber alone, without other forest produce, such as tar, pitch, resin, and bark. The whole of the forest produce imported into this country really amounted to about £30,000,000. With regard to European countries, France was not in a position to supply all her own industrial wants, but was importing a large amount of timber every year. We must also look for a cessation of the timber supply from the Baltic in a very short time; the countries in that neighbourhood had lately been supplying small timber, which showed that they were cutting down miniature trees. There could be no doubt that one of the main economic causes which had hindered the progress of Ireland had been the destruction of her forests. The forests had been destroyed, partly in order to prevent the natives from sheltering there from their oppressors and partly for smelting purposes. The amount of woodland in Ireland was decreasing; there were now 45,000 acres less than in 1841. The total amount of timber now standing in Ireland was only 350,000 acres. How much this was below the amount of woodland Ireland ought to possess, was seen from the fact that the best authorities had held that to keep a country in good order and ensure the proper growth of crops, from one-third to one-fourth ought to be protected by woodland. The amount of woodland possessed by

Great Britain, though much larger in proportion than that of Ireland, was small compared with other countries. In Prussia there were 34,000,000 acres, in France 22,000,000 acres, in Austria 23,000,000 acres, and in Hungary 22,000,000 acres of woodland. To the excellent management and cultivation of her forests he believed that the present prosperity of Hungary was in a great measure due. He had no hesitation in saying that the amount of timber in the British Empire was infinitely below what it ought to be for the proper protection of the soil, the proper protection of flocks and herds, and for the general development of industry. At present a large amount of timber was imported into this country; if through war one single year's supply was stopped, many industries would be ruined for years to come. How much might be done by the State for forestry was, he thought, shown by the conduct of our Indian Government. The Indian Forestry Department had saved the Indian forests from the destruction and devastation to which they were rapidly becoming a prey, and had made their administration financially and in every way a great success.

Sir H. Maxwell, as representing a Scotch constituency, wished to say a few words in support of the motion. He thought it was Dr. Johnson who, on the occasion of his visit to Scotland, said that during the whole of his travels in that country he never noticed any trees large enough to hang a man upon. (Laughter.) If that was a true picture when Dr. Johnson crossed the Border, the case of Scotland was very much altered now. Without the encouragement of the Government, the Scotch people had done a great deal in this matter for themselves. Private enterprise had been largely instrumental in reafforesting many of the barren hills of Scotland. He might instance the county of Inverness, which now contained over nine hundred thousand acres of woodland, the largest area in any county in the United Kingdom, not excepting Yorkshire. He thought that perhaps no stronger argument could possibly be put forward in favour of the appointment of this Committee than that urged by Sir John Lubbock, that this was the only great country in Europe that took no notice at all of the national property in its forests. We had throughout the country three million acres under wood, and yet towards the proper management of this property the Government did absolutely nothing. On the contrary, the Government not very long ago offered direct discouragement to it, when the Act was passed relating to the rating of woods and forests. He did not maintain that woodlands ought not to be rated. As a large real property it certainly should be rated; but, nevertheless, it was a great discouragement to owners of wood that this at present least remunerative form of property should be rated so highly. (Hear,

hear.) The Prime Minister told the House last night that at this period of the session little could be expected from the labours of a Select Committee, but if they were not to expect the establishment of a School of Forestry in this country, they might at least expect that an immense amount of information would be collected and placed at the disposal of the public. It might be asked, What was the difference between forestry and any other mode of culture? It might be asked, Why should forestry be encouraged by the State in preference to horticulture? Well, he was prepared to maintain that there was an immense difference between forestry and all other classes of rural industry; it called for the exercise of an amount of foresight and patience and self-denial on the part of those engaged in it which was not met with to the same extent in such pursuits as agriculture and horticulture. Moreover, the returns to be derived from it were not immediate, but slow in their operation. They might expect from the labours of a Select Committee an immense amount of knowledge, which at present was not accessible. They would receive information on such an important subject as the best kind of timber to cultivate in different localities. There was an immense quantity of money wasted just now in the pursuit of mistaken forestry operations. (Hear, hear.) No one who had paid any attention to the subject could fail to be distressed at the hundreds and thousands of acres of neglected woodland which were everywhere to be seen. This did not apply to the rural hedges in England, but when they got into the woodlands and looked around, there was very much to lament and regret. Considering the amount of private energy which had been expended in the formation of woodland in certain districts, he did not think it was too much to ask the Government to take steps to place within the means of the public the best information which it was possible to obtain. (Hear, hear.) The present Prime Minister, as they all knew, took a great deal of pleasure in some of the pursuits connected with arboriculture—(Laughter)—and it was surely not too much to expect that he would extend his notice to the constructive arts of arboriculture as well as to those which were destructive. (Cheers and laughter.)

Mr. GLADSTONE—I will answer the appeal of the hon. member, but I am sorry to say that I must accompany what I have got to say with a criticism. He says he hopes I will consent to add constructive to destructive arts in arboriculture. I should have hoped that the hon. gentleman would have been disposed to contend, as I am disposed to contend, that those who cut down trees are the only true conservators of our woods. (Cheers and laughter.) He says most truly that there is a multitude of ill-managed woods in this country, because of the superstition of their owners, which prevents them from properly thinning and clearing their woods. I confess that the principle is capable of very wide application, going far beyond the limits of the present debate, but I may contend that nothing does more to increase the ground of complaint with respect to the condition of our woods and plantations than that superstition which leads owners to think that it is a kind of sacrilege to cut down trees, instead of regarding it as the only way of keeping them properly. I agree that it is quite worth while to appoint this Committee, but I must make certain reservations. I do not wish to be bound that the Government will establish a Forestry School. I will give the reason why there should not be any foregone conclusion on that subject. My hon. friend who made this motion has spoken of the Forestry Schools which have been instituted abroad. That was quite true, but there are two observations to be made upon it. First, they have to depend on direct aid ; and, secondly, the scale of operations is infinitely larger. I cannot agree with the hon. gentleman who said of the county of Inverness that there were 900,000 acres. I am convinced that there must be a complete error there. There can be nothing approaching to that in the county of Inverness; in fact, I think the whole amount in Scotland does not reach 900,000 acres.

Sir H. MAXWELL said he might have been wrong about the figures, but Inverness was larger than any other county in the United Kingdom.

Mr. GLADSTONE—I do not much contest that, but there are one or two other counties also very large.

Sir H. MAXWELL thought the amount for Inverness was 400,000.

Mr. GLADSTONE—I am afraid I cannot afford that ; I think my hon. friend who introduced the motion said the total for England was 2,800,000 acres.

Sir J. LUBBOCK—Including Scotland.

Mr. GLADSTONE—I believe this, that there is plenty of room for improvement in the management of woods in this country. (Hear, hear.) Everything is done almost at haphazard. There is no fixed tradition, there is no authoritative system ; and I may say, though the land agents are a body of men quite as intelligent as any other class in the community, and in many cases of very high intelligence indeed, yet it is rare to find a land agent, as far as I know, who has any practical or useful knowledge of forestry. (Hear, hear.) You will find them men admirably qualified for every other department of their duty, and yet unable to lend assistance in this respect. I wish to be quite free on the question of the establishment of a Forestry School, and I mentioned one reason why we should be free. But another is this—allusion has been most properly made to the study of forestry in India, and eulogiums have been pronounced, which I believe to be heartily deserved, upon the leading servants of the Indian Government who have been connected with that interesting subject. The Indian Government has had the most special reasons for giving attention to it. First, there was the great question whether, when pursued on a large and systematic scale, it was possible to make forestry profitable. I certainly have the hope that that question either has received, or is in course of receiving, a satisfactory answer in the Indian dominions of Her Majesty. But besides that, in India there have been most important reasons connected with climate, with the provision of a due supply of moisture in the air, and with the regular growth of the food of the people, which give an altogether extraordinary importance to the subject of forestry in India. But the Indian Government had, and still has, a School of Forestry in India; and that school, as I understand, though it belongs to the Indian Government, is not in any way confined to persons connected with India or contemplating residence in India. I understand it is allowed to any one desirous, and able to pay the necessary fees, to be a candidate for admission to that school. It is possible that very valuable assistance may be derived from that school for the purposes of afforesting in England. But I think that besides the comparatively limited scale of operations in this country, we have some other difficulties to deal with. First, our woods are so broken down into detail that the number of properties on which there is the amount of wood that would admit of the large application of systematic training is not great. I myself have had a good deal to do with one estate which has a growth of some 6000 or 7000 acres of wood, and that is a growth extremely rare, not in Scotland, but in England. But besides the fact that our woods are so cut down into small bits of patchwork on the face of the country, it must never be forgotten that they are not kept here to any large extent for the purpose of profit as woods, but for the purposes of landscape beauty, and of pleasure and of sport—of sport above all. (Hear, hear.) All these things must go, I think, to moderate our expectations as to what can be done; but at the same time it is quite true that my interest in these subjects has certainly caused me constantly to observe, from the manner in which woods are managed, and the degree of accomplishment and attainment brought to the management of them, how much might be gained if there were more of common tradition on the subject—which common tradition must be the fruit of a good deal of training. There are some parts in this country—in the Midland counties—where, I believe, the art of woodcutting is practised with a nicety, and, I believe, with an actual beauty, which is not to be found anywhere else; but there are other parts where nobody knows how to cut down a tree. (Laughter.) That deficiency indicates a general want of attention to the subjects. I will not enter any further into the matter. The subject is one of very great interest, and I have some considerable hope that great utility will arise from the inquiries of this Committee. I think the hon. member who has just sat down did not catch exactly what I said yesterday on the subject of a Select Committee that might be appointed this session. On the subject to which I then referred, it would not produce a satisfactory result. But with regard to the Select Committee here proposed, in the first place, my hon. friend has given special reasons why at this moment the appointment should be made, and, in the second place, although it is true that the working time will be short, and that a dissolution is likely to intervene between this session and next, still a partial inquiry this session may perfectly well be made, and taken up in a future session and carried on to its completion. Therefore, it will be understood that we remain perfectly free with respect to the direction which the inquiries of the Committee may take, and the recommendations it may make, upon which it will be the duty of the responsible Ministers of the Crown for the time being to pass judgment. With that due and just reservation, I can give my hearty support to the proposal, and I sincerely hope that very great benefit may result from the Committee's labours. (Cheers.)

Sir W. Barttelot said that this important question had been greatly neglected in this country. Few men knew how to thin a plantation, and scarcely two would agree as to the proper time when the thinning should take place. It was on this account that our plantations in England had suffered so severely. He agreed entirely with the right hon. gentleman opposite as to the area of land under woods in this country. He did not think that anything like the area was under wood which had been stated by some hon. members. In the eastern division of Sussex they had turned their attention towards the cultivation of undergrowth and underwood, with the result that they found employment for large numbers of people during the winter months. (Hear, hear.) In pursuing this course, however, they could not shut their eyes to the fact that the value of this underwood and timber had greatly depreciated, and it would not be until there was a diminution of the supply from abroad that the value of timber in this country would rise to a fair level. He was informed, however, that nearly all the timber near the water-courses of America, from Italy and Spain, had been cut, and there was but little chance of many large supplies reaching us in the future from those countries. He therefore hoped that we in this country should not neglect planting timber which will grow fairly well on land that was not good for agricultural purposes. He believed that this Committee would do a great deal of good, and he should be glad if one of the results of the inquiry was to teach young men the art of cultivating timber. As it was, there was considerable difficulty in getting men to manage woods properly. (Hear, hear.)

Dr. FARQUHARSON expressed his satisfaction with the statement which the Prime Minister had just made in agreeing to the appointment of a Select Committee. He came from a part of the country where a great deal of planting was going on, as the Prime Minister well knew. Although those planting operations were conducted liberally, and largely, and well, he was afraid that, as had been observed, there was a little too much of the haphazard about it. If they knew a little more about planting, they would be able to do it better and on a more remunerative scale. They heard a great deal about increasing the agricultural outcome of the soil, but very little of the increased value of land that might result from a better system of planting and growing trees. (Hear, hear.) A great deal of land was now used for agriculture which was not fitted for it, whereas if they came to the conclusion that it was best in every case for waste land to be planted, we should obtain excellent crops of trees, and, he thought, confer great benefits on the country with respect to the climate and in many other ways. It was very discreditable to this country that it should be obliged to send its young men to France, Italy, or Germany to learn a subject which might, with proper material, be so well taught at home. He was sure that they had in Scotland a sufficient number of excellently-managed woods to provide opportunities for teaching young men how planting could best be carried on. He would allude specially to those admirable plantations of Lord Seafield, which were so capably superintended by the member for Portsmouth (Mr. T. C. Bruce). (Hear, hear.) At the present moment he (Dr. Farquharson) had a young forester who was anxious to receive scientific instruction, but he did not know how it could be got unless at great expense, if he were to be sent abroad. He hoped in future years they would be able to get such instruction as this at home. He had been very glad indeed to hear of the appointment of this Committee, and he was quite sure that from its deliberations great good would ensue. (Cheers.)

Mr. DAWSON thought the question might serviceably be brought before the Committee on Irish Industries, as there was no part of the United Kingdom where improved methods of forestry would be of more advantage than in Ireland. The hon. member for Dublin, who had made himself remarkable by devotion to this question, had dealt instructively with many branches of the subject, but there was one to which he had not referred. In the Black Forest and in Switzerland the young people were profitably employed in making the thousands of toys which were imported into this country. There was no reason why many thousands of our unemployed and starving population might not find the means of subsistence in this industry. The Prime Minister had deprecated the interference of the State, but the State had in Holland reclaimed the land from the sea, and here at home was expending its resources in teaching many subjects to the children of the poor, which, from a wage-earning point of view, were absolutely useless. (Hear, hear.) It would be much wiser that children should receive good technical training in the trades by which they were to make their living. (Hear, hear.)

Sir G. CAMPBELL thought one had no need to go farther than Kensington Gardens to see what a lamentable want existed of scientific forestry in this country. He agreed that the Indian Forestry Department had done good work, but he was inclined to think that it had been a little overpraised, as there was a great want of scientific method in the system which it pursued.

Mr. ACKERS said that subject was one in which the three kingdoms were equally interested. There was no good School of Forestry in the country, and the art of forestry might be said to be absolutely unknown. Similar treatment was apparently applied to all trees alike, and it did not appear to be known that what was good for one tree killed another. While agreeing with the Prime Minister that there should be no foregone conclusion, he hoped the matter would not be entered upon with the idea that a School of Forestry was not necessary, and that Government assistance should not be given to it.

Sir J. Lubbock's motion was then agreed to.

ON PRUNING.

BY WILLIAM SUTHERLAND.

WHY WE PRUNE.—To the arboriculturist, a tree growing as nature directs, represents the shapeless block of marble ready for the sculptor's chisel, or the raw material of the manufacturer. But a tree is a thing of life under fixed laws of development, not an inert mass. So, while the sculptor eliminates from his marble a creation of his imagination, the forester has to make himself acquainted with the particular mode of life of each tree on which he proposes to operate, so as to mould it into a thing of beauty, or an article of commercial value. This is specially true of pruning operations which are either utilitarian or ornamental, the production of fruit not being in the ordinary sense an object of such handicraft. But the obtaining of good timber, together with grace of form, may be accelerated by skilful pruning, which is simply such regulation of the growth of the individual tree as to prevent waste or misdirection of physiological energies in the production of limbs neither graceful nor valuable. Though crooked timber, rendering the parent trunks commercially more valuable than the straight variety, is often aimed at by pruning, the object to be attained is the same. Whether it be the production of a straight upright trunk or a tortuous one, or the development of trunk-like branches which in mature trees are often of great value, there must be the same careful husbanding of the energies of the tree, the same focusing of its circulating sap in the direction desired, in order to attain the best results in the shortest period of time.

HOW TO PRUNE.—On this point there is great diversity of opinion amongst practical men. Some believing in nature's efficacy as a pruner, and ignoring or forgetting altogether the irregularity and uncertain character of her operations, say, "Prune not at all. Leave all to nature, and the result cannot fail to be good." Nevertheless it is often very bad, a fact always discovered when too late to mend everything in connection with the case. The observer will learn that nature as a pruner when left to herself is a failure and a fraud, returning only shapeless hollow trunks and unmarketable timber for the confidence reposed in her. Others rush to the opposite extreme and whittle off the lateral branches continually, much as if the sole object of arboriculture were the production of May-poles and the destruction of the natural balance and symmetry of the tree operated on. These also ultimately find the market value of their timber an unremunerative quantity. And there is a third school, which, while recognising the necessity for pruning, defer the operation till it is too late. They permit nature to have her own way for many years unchecked; the result being, for the most part, trees more or less disfigured by accident, and the unrestrained tendency to irregularity which is inevitable in a greater or less degree in all kinds of trees. Operations are then begun with saw and chisel, but it is too late. The immediate result is crippled trees, which become a prey to premature decay caused directly by sheer dismemberment and mutilation done in the name of pruning. Profitable results can never accrue from such treatment.

These practices are founded on ignorance or misconception of the physiological laws of tree life. There is no understanding of the intimate relations that subsist between root, stem, branch, and leaf, evinced by those who treat trees under their care in either way. Pruning should never, except in cases of extreme necessity, be allowed to take the form of amputation. Every leaf and branch during the period in which the structure of the tree is being formed, is of vital importance to the object in view. The forester's care should be to preserve all in perfect balance. He must remember that the reciprocal action of the roots and the leaves of a tree forms the economy of its life. He cannot cut its roots away and reasonably expect the foliage to expand, nor denude it of foliage without paralyzing the functions of its roots. The use of the saw, the pruning-hook, or even the knife, should be avoided in pruning as much as possible. They are mainly valuable in remedying the ill effects of accident or neglect. The finger and thumb are the only instruments essential to the moulding of the structure of a well-balanced tree while it is young. When it becomes older, the use of implements may become necessary to maintain the balance established; the removal of ill-placed branches, the checking of laterals that compete with the leader for supremacy, and over-luxuriance in any part at the cost of other parts. All trees, it may be observed, are more or less pyramidal in the form of their growth while young, and that particular form is maintained in many to an advanced age. The advantages of this form in respect of the action of light on all parts of the tree are obvious. The bulk of the foliage is displayed below and cannot be overshadowed by that above, hence the benefits of the influence of the sun are distributed in an equal degree on all parts alike. The tendency after a time in hardwood trees is, however, to break away from this form into irregularity. This must be checked by the forester, who stops or pinches away the first break *that manifests itself in this way.* Two leaders should never be permitted to compete with each other; the weakest or the worst placed one must be removed by rubbing it off, while soft enough to be so treated. So, all lateral shoots that show a tendency to disturb the balance of foliage at all sides, should be stopped in their centres so as to check the flow of sap towards themselves, and divert it to other branches of weaker character.

WHEN TO PRUNE.—As in regard to the mode, so in regard to the best time for pruning, there is great diversity of opinion. But there are many reasons in favour of doing all manner of pruning during summer; excepting perhaps rough amputations which would prove inconvenient and also destructive to foliage if done at that season. The most obvious advantage of summer pruning, over that of any other season, is that wounds, if any are made, have to cicatrize to some extent before growth ceases. Some trees, while they are in growth, having a tendency to bleed if wounded, must not be pruned when there is any risk of this taking place. The pruning, however, of all young trees in the way in which we conceive it should be done, as indicated above by means of stopping, must necessarily be done in early summer while growth is young and soft. May and June are therefore the fittest months of the year for this kind of pruning, and we are persuaded, from long experience and observations, that those who prune most in that way during the early years of the life of their young trees will have their reward in well-conditioned plantations, which will in due time repay the cost and trouble expended on them.

FOREST LITERATURE FOR 1884.

(*Concluded from page* 24.)

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PROPAGATION OF TREES FROM SEED.

Extracts from a paper read by Jackson Dawson before the Massachusetts Horticultural Society in Boston, March 7.

We may learn much from nature in her methods of raising trees from seeds, though we can improve upon some of these methods, and supply ourselves with trees more economically. The sowing of seed where the trees are to remain is poor economy.

In selecting a place for the seed bed, the soil for all large seeds should be a deep, rich, mellow loam, avoiding, if possible, all thin, gravelly soils. It should be well manured with good manure a year old, ploughed and trenched from 12 to 15 inches deep, well pulverized with a harrow, and all large stones, grass and other rubbish should be raked off, so as to have the soil in the finest condition. It should be well sheltered from the north and west winds either by a hedge or temporary fence. If springy or low, it must be well drained. If the seed is to be sown in the beds, they should be 5 feet wide, with paths 2½ feet between. Sowing in rows 9 inches apart across the bed is preferable to broadcast sowing, or the seeds may be sown in long nursery rows, 18 inches apart if to be worked by hand, or from 2½ to 3 feet apart if cultivated by horse power. The beds are more easily shaded and watered than long rows, and in the fall more easily protected.

Seed should never be sown when the ground is wet or when it is raining. The soil should not be too dry, but in such a condition that it can be raked without clogging. If the soil is too wet it will bake hard, and a great many seeds will scarcely come through. If too dry the seed is apt to wash out unless covered deeper than is necessary. Light lath screens should be provided to shelter the very delicate plants from the hot sun.

In sowing in the fall begin with the oaks, chestnuts, chinquapin, hickory, and beechnuts, which do not retain their vitality long, and must be either planted or put in boxes of earth as soon as possible. If sown broadcast they should be scattered thickly and evenly over the bed, and pressed down with a light wooden roller or the back of a spade, and covered with a little more than their own diameter of soil, which if beech, chestnut, and oak would be nearly an inch, and for hickory, black walnuts, butternuts, and horse chestnuts from 1 to 2 inches.

The maples, with the exception of the white and red, which ripen their seed in June, should be sown as soon as possible after gathering, and whether in drills or broadcast should not be covered more than twice their diameter. If covered too deep, they sprout and rot. If maple seed is allowed to get thoroughly dry, and kept so until spring, very few will come up until the second spring.

Ash must also be sown as soon as possible after gathering. The hornbeam and hop hornbeam, unless sown in the autumn, will not come up until the second year. The tupelo, flowering dogwood, shad-bush, nettle tree, or hackberry and thorn, seldom come until the second year, although there are a few exceptions. The plum, peach, apple, and pear never come up evenly the first year unless the seed has been frozen or kept in boxes of moist earth. A great many roses will not come up the first year, even after having been frozen, although the seeds of hybrids will, if frozen for a week or two, come up in less than a month.

Such seeds as those of the Judas tree, three-thorned acacia, Virgilia or yellow wood, and the Kentucky coffee tree, being very hard, should have boiling water poured over them and stand for twenty-four hours, and the swollen seeds separated by sieves of proper size. It will be fit for sowing, and the rest should be treated to another hot bath until they have all swollen, otherwise they will keep coming up, a few at a time, for a year or two.

The ailanthus, catalpa, mulberries, button-ball, birches, and alders are best sown in spring as soon as the ground is dry enough to work. The soil should be very fine and the seed lightly covered. The white and scarlet maples, the elms, and the red or river birch ripen their seed in early summer, and should be sown in freshly prepared beds as soon as gathered. When a large quantity is planted and no screens are at hand, birch brush laid thinly over the bed is a great help.

If well taken care of, the seedlings will make plants from 6 to 12 inches high the first season. In ordinary loamy soils seeds should be covered their own diameter, or a little more, in depth, in very light or sandy soils twice as deep, and in clay as lightly as possible.

Such seeds as magnolias, roses, and mountain ash, which are enclosed in a fleshy pulp, should be macerated in water at from 70°

to 80° temperature for a week or two, and then washed out and sown before they are thoroughly dry. This often helps germination, especially in the magnolia. If this is sown as soon as gathered, there is an oil in the pulp that seems to penetrate the seed and make it rancid.

When seeds are sown in the fall, it is well, as soon as the ground is frozen, to cover the beds or rows lightly with hay, pine needles, which will keep the ground from freezing and the heavy spring rains from washing up the seed. All seed beds and rows should be kept free from weeds, and, except when sown broadcast, as soon as they are up the ground should be hoed or cultivated frequently. This makes the young plants push with greater vigour, and enables them to withstand drought better. If the weather becomes very warm or dry, the young seedlings must be well watered once or twice a week —not a slight sprinkling on the surface, but a thorough, good soaking, wetting the ground from 4 to 8 inches deep. After the first of September the water may be discontinued, to allow the plants to ripen their growth.

All young seedlings sown in drills will stand better if at the approach of winter a plough is run between them, throwing a furrow against the stems, covering them several inches deep. This keeps the young plants from heaving with the frost, and also keeps the water and ice from settling around the stems, which often causes great injury. Those sown broadcast should have a slight covering of hay or leaves as soon as the ground is frozen.

In transplanting the young seedlings it is important they should not be exposed to drying winds or hot sun, even for a few minutes. Many failures in tree-planting are caused by the drying up of the roots before planting. The soil should be well worked in among the roots and firmed with the feet.

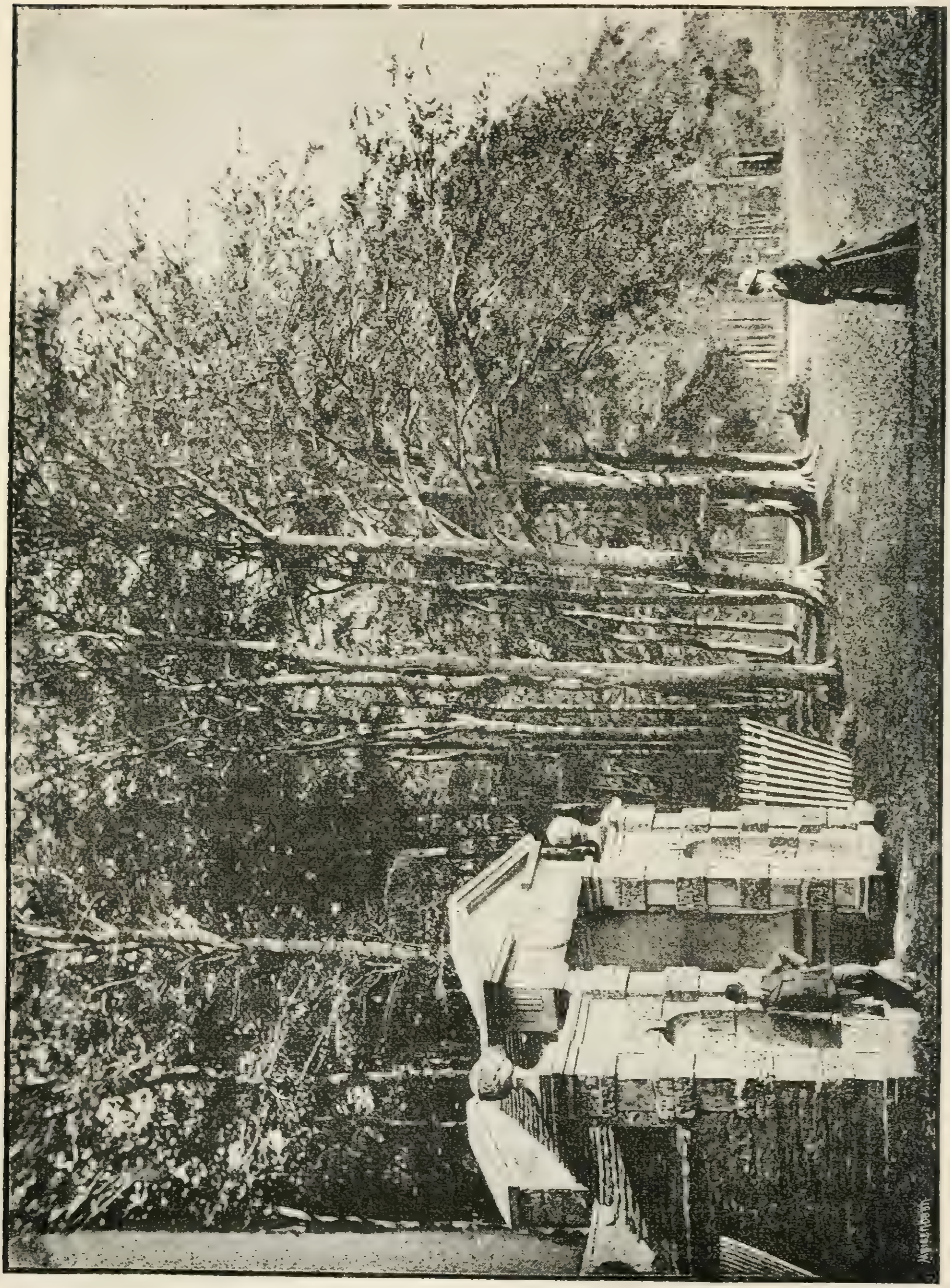
The conifers, such as pines, spruces, larch, cedar, and hemlock require much more care and attention to grow from seed than any other class. Many of the finer kinds it is impossible to raise out of doors in this climate. The ground for such as are planted out-doors should be rich, light loam. They require to be carefully sheltered and shaded, but especially when the seed is old they do not require so much moisture during germination. When pine needles are plenty, they may be strewn between the rows thinly as a mulch. The critical time is the first three months of their existence. The use of lath screens on seed beds saves a great amount of labour in watering; and if the plants are neglected for an hour or so, the result is not so disastrous as when the young seedlings are exposed to the sun. The situation for these should be a sheltered place, as free as possible both from midday sun and drying winds.

The seeds of those varieties difficult to transplant should be sown in boxes 3 or 4 inches deep. They should have holes in the bottom for drainage, and for fine seeds should also be well drained with potsherds or other coarse material. The boxes may be stored in a pit and covered, not thickly enough to keep them from freezing, but so as when once frozen not to thaw until spring. Trees raised in this way can be transplanted with the smallest possible risk. The boxes must be protected the second winter, as the young seedlings would be sure to suffer with so little depth of soil. In this way many of the finer seeds can be grown that it is impossible to grow out of doors.

DRAINING MARSH LANDS.

DR. C. W. CHANCELLOR, in an interesting paper read before the Farmers' Society of Maryland, Virginia, in referring to the proposed drainage of marshes in his own State, gives the following details of the drainage by machinery of extensive tracts of marsh land in European countries :—The young power of steam, applied to the drainage of marshes, has quite supplanted windmills in all parts of England, and is also extensively used in Holland. The usual arrangement is a vertical scoop-wheel which dashes the water up an ascending curve with great power. In what is called the "Great Level," where there were formerly 700 windmills, there are now only a few ; but the number of steam pumps employed is about seventy, varying from 10 to 80 horse-power, and raising the drainage water of at least 250,000 acres. The centrifugal pump surpasses even the wheel in the percentage of duty it performs in proportion to the power employed.

One of these pumps has been found to drain effectually a marsh of upwards of 3000 acres. The disk, four feet and a half in diameter, worked by a 25 horse-power engine, throws up 75 tons of water per minute, five feet high, or 100 tons per minute between two and three feet high. Exaggerated conceptions are frequently formed of the cost of raising water with pumps worked by steam power. It appears from the best evidence collected on this subject that the cost is really an insignificant item. The siphon has been recently shown, as at Warwick and at Culhorn House, Wigtownshire, to be a more satisfactory instrument of marsh drainage than either the windmill or steam engine, while involving much less working expense.



POPE'S SEAT.

A DAY IN AN ENGLISH PARK.

BY D. F. MACKENZIE, MORTONHALL, MIDLOTHIAN.

PART II.

THE arboriculturist may find much to interest him in Cirencester Park, especially the parts near Earl Bathurst's mansion-house, and in the park. Near the south-west front of the house are two large horse chestnuts of a rather peculiar habit of growth, and a few large cedars of Lebanon, as well as other large specimens of oak, elm, etc. The horse chestnuts, which are about five and a half feet in diameter, have long pendulous, rather slender branches, many of which have got self-layered, and are forming a line of moderately-sized trees, which in turn have many of their branches in a fair way of becoming layered also. The outline of these two trees with their "family" presents the appearance of one huge tree, and must be very picturesque when in full leaf.

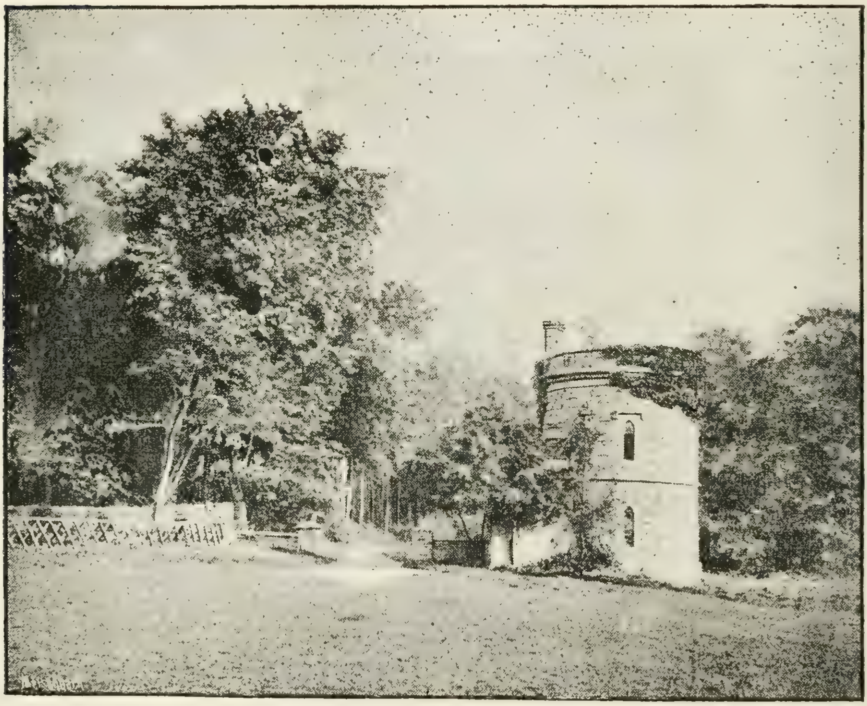
The cedars are also very large for their age, which is said to be about eighty years. In some instances two or three of them have the appearance of one wide-spreading tree. The principal tree of one of the groups is over five feet in diameter, having a spread of branches of over one hundred feet. Several of its gigantic horizontal limbs are supported by massive iron hoops suspended by continuous "rod" chains to the upper portion of the trunk.

Near to these, as well as in several parts of the park, are several very fine specimens of the Lucombe oak; though a sub-evergreen, they were quite as green in the first week of January as they are in the midland counties of Scotland in the month of September. There are also many fine specimens of the common oak, the English elm, and the beech.

Although the newer coniferæ are seldom met with in the park, there are many fine specimens of *Cupressus Lambertiana, C. Macrocarpa, C. Lawsoniana,* etc., thirty to fifty feet in height, clothed to the ground. Several of the specimens are very handsome. The *true* pines, spruces, and silver firs of the newer and ornamental varieties are nearly absent, though these would undoubtedly thrive very well, judging from the magnificent examples which are to be found all over the park of the Scots fir, spruce, and silver fir, as also the larch.

The Scots firs, I believe, are amongst the largest *planted* trees of the kind, taking them as a whole, and can only be equalled by those on Colonel Trotter's Charter Hall estates in Berwickshire. The time was when many rivals could be seen in the counties of Aberdeen, Inverness, and Perth, but with the exception of those of *natural* growth they have long ago ceased to exist. It is to be regretted that Earl Bathurst and Colonel Trotter did not think of sending at least one example each of these firs to the Forestry Exhibition in Edinburgh. Had they done so, Her Majesty's exhibit from Ballochbuie would have had formidable rivals, both as regards size and quality.

The larches are not very large trees, yet the crop is so uniform that one would be apt to suppose himself in a Perthshire larch forest. The trees are very fine, giving good timber, and almost entirely free from disease. The spruces also grow to large sizes in many parts of the park, though in many situations they are affected with heart-rot, which renders the timber comparatively useless. Perhaps one of the most interesting sights to the ordinary forester and woodman in a general sense are the "Cathedral Firs." These spruce firs form a large clump in the shape of a huge monogram, or several crosses, situated in a lonely spot several miles from the park entrance, and are perhaps the finest lot of spruce, as a whole, in the kingdom.



THE ROUND HOUSE.

They are over 130 years old, nearly the same number of feet in height, from two to three feet in diameter, and as straight as an arrow, many of them having only a "tuft" of branches atop. An illustration of these firs appeared in our issue of last month, page 12. The silver firs are also of goodly dimensions, and, excepting in a few instances, are free from disease.

The illustrations in our present issue were referred to last month. See pages 13 and 14.

As might be expected from the nature of the soil in the district, which is on the oolite formation, the beech is indigenous and predominates, being, of course, quite at home; the timber is clean, well grained, and of excellent quality. The ash and "cork-barked" elms are also at home, and grow thickly all over the park without attention, sometimes to the disadvantage of the other crops.

THE OCTAGON.

Perhaps evergreens are only needed to complete this arboreal paradise, but the nature of the soil admits only the growth of the true pines, some of the Abies and Piceas, many of which would grow well on diverse sites in this park, and become valuable timber, having for under covert the common Mahonia. It would, however, be both difficult as well as expensive to carry out this idea on a large scale; for the plants employed would have either to be very large or very small, having the spaces to receive the small plants pared. The latter mode would best secure a full and valuable crop. If planted immediately after the "fall" of timber was removed, the work would be easier and the results better.

In conclusion, I may say that the woods within the park were the cleanest kept that I have had the pleasure of visiting. The practice of faggoting may account for this to a considerable extent, but apart from that, the whole was very "trim," and with only a little pruning and a good deal foreshortening, the management might be reckoned to be fairly complete. I have often heard it said that if ever one saw a well-managed establishment in England, "rest assured that a Scotchman was at the head of it." In this case at least that is not true, as the woods and estate are managed by Englishmen, from whose "books" many of our Scottish foresters, etc., could get a few wrinkles, especially in tidiness.

Many items of interest are omitted, as my limited stay prevented me filling my note-book with elaborate arboricultural details; besides, a volume could be written in praise of the park.

ROYAL HORTICULTURAL SOCIETY.—At the May meeting of the Scientific Committee of this Society, Mr. Saunders, of Lee, Kent, sent branches of an oak on which not a single leaf could be found which had escaped the attack of the caterpillar of a small moth—*Lithocolletis messaniella*, and at the same time leaves of a holly much disfigured by that small dipterous fly *Phytomyza illicis*. The Rev. G. Henslow showed sprays bearing fruit of last year, of a single shrub of Lauristinus, in a spot overhung by a Deodar, and otherwise shaded. Bushes well exposed bore none.

THE BEST AND MOST ECONOMICAL SYSTEM FOR THE AFFORESTATION OF WASTE AND OTHERWISE UNPROFITABLE LANDS IN THE UNITED KINGDOM.

By William MacIntosh, Assistant Forester, Lovat Estates Office, Beauly, N.B. Being the First Prize Essay awarded by the Scottish Seed and Nursery Trade Association, Session 1884.

Part II.

IV.—*The Selection of Plants and Planting.*

THE ground to be planted should be drained the previous summer (or if possible sooner), ere the planting operations are commenced, so that the soil may become solidified where peaty, and everywhere freed from sourness arising from stagnant water.

The manager or superintendent some time previous to his selecting the plants should go carefully over the enclosed ground, in order to find out the different kinds of trees to which the soils are adapted. Success in a great measure depends upon the judicious distribution of the various plants upon the soils best suited for them. Nature is the safest guide here. Altitude is also of the greatest importance; but in regard to this, we must be entirely regulated by the situation. Trees may flourish luxuriantly upon a tableland sheltered from the prevailing winds by a higher hill; while at the same height, on an exposed site, we would only have stunted bushes. The altitude, therefore, at which trees should cease to be planted, must be left to the judgment, based on practical experience, of the superintendent. But we may here state that, in cases where success is very doubtful, it would be best to leave the more exposed parts unplanted for a year or two, so that the planter would be able to judge, by the appearance of the highest exposed plants, whether it would be advisable to extend his operations or not. Where the bilberry, bracken, and close healthy heath mixed with common grasses cease to luxuriate, he need not expect a very profitable crop to grow. Bearing in mind what has been said regarding altitude and shelter, before going to the nursery to select the plants, we will now turn to the consideration of the different soils and the plants best suited for them.

Moorland and Hill.—Upon peat moss with a clayey subsoil well drained, which should be done a year or more before planting birch, poplar, alder, and Scots fir may planted. Peat, sandy or heathy soils, resting upon ferruginous clay, will grow Scots fir, larch, spruce, scycamore, and birch.

Hillside and Tableland.—Sandy loam resting on sand or gravel will grow birch, larch, Scots fir, and almost all the fir tribes. Chalky soils resting on calcareous sand are well suited for beech, and will grow ash and oak.

Valley.—Moist clay, with a mixture of gravel and sand, will grow oak, ash, hornbeam, spruce, and almost all the varieties of pine. A clayey loam with a clay and gravel subsoil, will grow almost all the kinds of timber trees indigenous to our country.

Selection of Plants.

In the selecting of plants from public nurseries, the purchaser should be careful to reject all plants that have the slightest appearance of being diseased. He should therefore visit the nursery in summer when the plants are in full leaf. Those that are overcrowded in the nursery rows should also be rejected; they are easily known: stems long and slender, but not well proportioned, bark very thin, a scarcity of branches and foliage, with few fibrous roots weak and badly developed. Plants of this kind should be avoided; as also those affected by fungi, aphides, caterpillars, and beetles, as change of soil and situation may only spread diseased conditions. The situation of plantation and nursery should be considered. Taking plants from a low-lying, well-sheltered nursery and placing them upon an exposed site is a great mistake. The sudden change affects them greatly; the sap circulation is checked, and the leaves are unable to perform their proper functions. For high-lying situations, Scots fir should be 2 year seedlings, 1 year transplants, well-rooted with short stout stems and foliage in proportion; the larch, 1 year seedlings, 1 year transplants, and hardwood not over 16 inches high. In moderately sheltered sites, the Scots fir, 2 year seedlings, 2 year transplants; and larch, 2 year seedlings, 1 year transplants, with hardwood from 2 to 3 feet high. In well-sheltered situations, the Scots fir and larch might be one year older, but should be transplanted twice. Very small plants would not suit on a site of this nature, as the rank grasses and weeds would choke them up before they could get established; and the labour of keeping them clear of such for two or three years, would be more than the extra price paid for a larger size at the nursery. Hardwood trees could be used here as high as 4 or 5 feet. The great cost of plants and planting in those parts of the kingdom where the climate is very moist, and the natural herbage grows rank and tall, is accounted for by the necessity planters are under for using large several times transplanted trees.

Planting.

Having the plants now selected they should be carefully lifted, leaving the roots as little as possible exposed to the air, and well covered with mats if they require to be carted any distance, especially if the air is frosty. Once upon the field of operations, they should be carefully heeled in the ground, each class of plants upon the division in which they are to be planted, so as to be handy for the planters when planting begins. All the small plants should be notched in, and pits be made for the large ones. The sizes of the pits should be regulated by the root room required by each tree; observing not to cram in any of the roots, but give them full room so as to be laid out in the pit to their full length. Oak and other hardwood trees should be root-pruned in the nursery about eighteen months previous to their being permanently planted out. In planting by the notch, each man with a half-worn sharp spade, cuts the surface like a cross, or in the shape of the letter T, and turns up the turf by pressing the handle of the spade towards the ground; a boy follows him and puts a plant into the slit, and treads down the notch again on each side of the stem with alternate feet. Where boys cannot be got for inserting the plants, a man with a light spade in one hand and plants in the other can plant as well, but not the same number as he would with a boy. The notch is made by two heavy cuts; and without taking the spade out of the cross (or last) cut, the handle is pressed towards the ground by one hand and the plant inserted into the open slit by the other. The spade is then withdrawn and the plant made firm by the planter's foot. In planting by this system it is necessary having a boy for every ten or twelve men, with a strong apron, to carry the plants from where they are heeled in the ground to the planters, and give a handful to each man as he requires them. A man and a boy in a day of ten hours on ordinary ground should plant from 1400 to 1600; a man alone, and well up to the work, should plant from 1000 to 1200 per day.

Distance apart at which Young Trees should be planted.

In treating upon this, we will observe the divisions we have already made for the different soils and plants.

A well-sheltered Valley.—Artificial shelter is of no consequence upon a site of this nature; therefore the distance apart at which plants should be set may be regulated by the nature of the local wood sales. Where no small wood can be sold to advantage, it would be waste of money and labour to plant too close (shelter being no object); 5 or 6 feet apart will suffice. But if the case is the reverse (small wood having a ready market), it would be wisdom to make the best of the land; therefore plant 3½ feet apart. If there is a fair price for hardwood, and soil suitable, plant trees of this kind 10 or 15 feet apart, and make up the intermediate spaces with pines and larch. But if the pines and larch be more in requisition than hardwood in the district, and the soil suitable to their growth, set the hardwood still farther apart, even to 40 feet, and fill up the intermediate space with the pines and larch. The old system of planting indiscriminately equal proportions of Scotch fir and larch should be avoided, as their nature and requirements are very different.

Hillside and Tableland.—Being only moderately sheltered, trees should be closer planted than those on sheltered sites, laying aside all consideration as regards the sale of thinnings, keeping only the good of the plantation in view. The distance we would recommend here would be about 4 feet apart.

Moorland and Hill.—Being high-lying and exposed, the planter's great aim is to get the trees to shelter one another as quickly as possible; regardless as to whether a ready market be found for the thinnings or not. The greatest distance apart here should be 3½ feet, and if much exposed 3 feet.

As we have already said, where shelter is of no object, the distance apart should be regulated by local demands; but where it is, the future welfare of the plantation should be the main consideration. Several kinds of timber trees thrive upon each class of soil; therefore the timber which is most in demand in that district should be planted.

The cost of making plantations of trees on the waste lands of the kingdom will depend upon the area of enclosure, the amount of drainage necessary, and the kind of herbage with which the ground is covered. Afforesting on an extensive scale will, for obvious reasons, cost less per acre than when small enclosures are dealt with.

The following is an example of the cost per acre of enclosing, draining, and planting with larch, Scots fir, and mixed hardwood, a tract of 500 acres of the waste land in the north of Scotland, applicable also to the hillsides of Ireland.

Approximate rate per acre for enclosing with a proportion of each kind of fence described, say 20 yards at 1s. 3d. per yard, . . .	£1	5	0
Do. do. for main road formed, say 7 yards at 10d. per yard, ...	0	5	10
Carry forward, . .	£1	10	10

	£	s.	d.
Brought forward,	£1	10	10
500 Larches, 2 years, 1 year, at 14s. per 1000,	0	7	0
2100 Scots fir, 3 year, 1 year, at 7s. per 1000,	0	14	9
100 Mixed Hardwood, at 30s. per 1000,	0	3	0
Planting, etc. the acre,	0	12	0
Proportion of drainage per acre,	0	7	0
Total cost per acre,	£3	14	7

The cost in England and Wales and the low-lying parts of Ireland is on an average £7 per acre. In these countries hardwood trees are more commonly planted, the herbage is more rank, and more draining is required; and in the two former countries labour is more costly.

In all parts of the kingdom, however, the enterprise of our public nurserymen has made the procuring of trees easy at low prices; and if the waste lands of our country remain unproductive, it cannot be attributed to the difficulty or cost of procuring trees. Why do the waste places remain waste, and the barren unfruitful, while the labourer wants work, and capital investment? Why does the wind sweep silent over treeless solitudes, while it might be making music among the boughs, and in joyous response "the forest clap its hands"?

THE TIMBER TRADE OF MEMEL.

BY HENRY F. MOORE, FROME, SOMERSET.

SO far as the timber trade of Memel is concerned, a recent report by Vice-Consul Richter to our Foreign Office shows that of late the demand in all markets was slack and prices receding. England, the principal customer for Memel, showed no inclination for any larger transactions. The facility given by the increasing number of steamers to provide for any demand in a short time, even the largest quantities, is gradually changing the accustomed mode of business, rendering all speculation unnecessary. The stock which remained unsold was large, and sales of the same could be effected only with difficulty at gradually declining prices, and in many cases at a loss; still considerable quantities were not sold yet when the new supplies from Poland arrived. These had been delayed by high water and contrary winds in the channels and the river Niemen, and arrived late, so that merchants here had only the two months, August and September, to purchase the quantity they require for the whole year. The Polish owners, who, in the expectation that the favourable state of 1882 would continue, had purchased the forests at high prices, could with difficulty resolve upon bearing great losses, and reluctantly accommodated their demands to existing circumstances; therefore not all the timber which came down has been sold, and particularly of fir and pine beams some lots were withheld, and have been placed into winter quarters at Russ. The new arrival is valued at about £441,970, whereas in the previous year £519,215 worth came down. The larger part of this deficiency arises by the lower value of oak staves, of which moreover the supply was 20 per cent. less. The value of all the timber exported was £614,200, against £609,650 in the year preceding. The shipments were effected in 647 sailing and 140 steamships, burden 197,804 tons, against, in 1882, 667 sailing and 56 steamships, with 150,565 tons, therefore the quantity exported has increased 31 per cent., the value of the same only about ¾ per cent., owing principally to the larger shipments of sleepers, a bulky article of less value than other wood goods.

Fir and Pine Beams.—The total arrival consisted of 72,780 pieces, of which 64,200 were sold, and 8580 remained unsold, and brought in to winter quarters in the river. From the beginning of the year, sales to England could be effected only with difficulty, the first prices, 52s. 6d. to 47s. 6d., for second middle average length, 26 to 27 feet, could not be maintained, and finally 41s. was accepted. Manerlatten beams, of weaker dimensions, from 42s. 6d. and 40s., declined to 33s. per load.

Fir and Pine Round Logs.—Owners of sawmills, being anxious to procure full employment for their mills, have again paid too high prices for logs, and as corresponding rates could not be obtained for sawn goods, have done a losing business. Three-inch fir planks at first bringing £7, 15s. per standard for second sort, and £6, 15s. for third, soon declined to £7 and £6 respectively. Pine planks sold at about 10s. per standard less, but in autumn the demand somewhat improved.

Fir and Pine Sleepers.—The supplies coming to our market are increasing from year to year. This larger supply has been caused by contracts during the winter, based upon the then ruling prices of 29s. to 29s. 6d. per load, which at the opening of the navigation were still obtainable, but as the demand for England soon slackened, they gradually declined to 26s. This rate leaves no profit, but as the article gives employment to many labourers who otherwise would have to be discharged, merchants are anxious to cultivate this branch. With the present method of loading timber, steamers are scarcely able to avoid finding that they are some sleepers short when they come to deliver their cargo; for there is an old custom at this port that all timber should be delivered to the mate of the vessel at the timber-yard, bills of lading being signed based upon his receipt. The more costly goods are transported in lighters, but for beams and sleepers this would be too expensive. They are therefore bound together in rafts and floated down the river to the ship, a distance of from one to two miles. Beams generally arrive in safety, but sleepers cannot be firmly secured; and whenever there is some wind or a strong current, the rafts get loose and some sleepers drift away, and cannot be recovered without danger to the remainder. The clause generally contained in the charter-party, "to be delivered on board," is vitiated by the words "as customary" being added, and so masters are compelled to receive delivery at the timber-yard. Merchants here insist upon this being the custom of the port; and masters have always submitted to it, partly, no doubt, because they find the arrangement not wholly without advantage, since by that means they can obtain the exact lengths and qualities which they at the moment require. If, on the other hand, merchants were to send timber to the vessel, the quantity sent would be either too great to be properly secured alongside, or too small, in which latter case the ship would have to lose time in waiting for additional cargo. To guard against being made responsible for short delivery, masters note protest, but the merchants refuse to accept a copy of a document so marked: but they object also to any remark referring to it being made on the bills of lading, insisting upon having them signed in accordance with the mate's receipt. They can force masters to give clean bills of lading by withholding their declaration of goods shipped, such declaration being required by the custom-house before they will grant clearing. Complaints have been made by steamship owners with reference to the above matter, but all my efforts to procure a change have been fruitless; and I cannot recommend an appeal to a court of law, since I consider that the issue would be doubtful, while the expenses would be great, and the object to be obtained trifling.

Oak Staves.—Early in spring a few sales were made at £180 per mille for crown-pipe staves, with first break at £30 less; but during summer the price declined to £140, the less suitable sorts being almost unsaleable. In autumn the demand was somewhat better, owing to the smaller supply coming down the river.

Crooked oak, as used for ribs of vessels, which in former years was found in this market, is not obtainable at present, shipbuilding having entirely ceased here.

Oak Beams.—Business in this article is becoming very difficult, the large dimensions generally required not being obtainable. For crown beams 85s. to 90s. per load was paid, 10s. less for second sort. The new arrival was 36,150 cubic feet against 53,820 cubic feet in 1882.

Oak Wainscots.—The old stock, consisting of 7450 pieces, was sold at 4s. 9d. to 4s. 6d. per foot crown, and 3s. 6d. to 3s. 3d. per foot second sort. This article is not sought after, therefore the oak is not worked in this manner, and the new supply consisted of only 3106 pieces.

Oak Sleepers.—51,852 pieces were imported, of which 37,553 pieces have been sold at about 3s. 3d. each, a price which barely covers prime cost.

MAGNOLIAS.

MR. S. PARSONS, in our American contemporary, *Garden*, classifies hardy magnolias suited for lawn planting into those which bloom before the leaves are formed, and those that bloom in June when the foliage is in full panoply. Of the latter two Japanese varieties, *M. hypoleuca* and *M. parviflora* are the finest for both leaf and flower. The foliage of *hypoleuca* is large, silvery underneath, and red-veined ; that of its companion, *parviflora*, is less striking, though rich and effective in texture and hue, but in odour it surpasses all other hardy magnolias, being strongly and delightfully spicy. The flower of *parviflora* is also remarkably beautiful, consisting of a milk-white cup-shaped form, suggesting remotely the bloom of *M. glauca*, and a magnificent crimson centre of curiously-arranged pistil and stamens. The odour of *hypoleuca* is also strong and pleasant. These late magnolias do not bloom as abundantly as the early flowering species and varieties, but their general effect on the lawn as large trees, whether in bloom or out of bloom, is always fine. Unfortunately they are, as yet, comparatively rare.

Magnolia acuminata, *tripetela*, and *cordata*, all native species, are excellent late-blooming fine-foliaged trees for the lawn ; but of all American kinds, *Magnolia macrophylla* is the most effective, with its great leaves, eighteen inches to two feet long, giving it the effect of some great tropical palm astray in the north. It is strange that this large-growing splendid tree is not planted more, for it is quite as hardy as other magnolias.

NOTES ON BRITISH ORCHIDS.

BY A. D. WEBSTER.

No. II.

O. morio (green-winged Orchis).—Tubers round or globose, and seldom so large as those of *O. mascula*. Leaves lanceolate, almost radical, and with a slight silvery hue overlying the otherwise dull green. Flowers in a loose spike, scentless, and usually purple, although forms with crimson, violet, and white flowers are not uncommon. Upper petals distinctly marked with green veins, which is a decided characteristic of the plant. Lip three-lobed, crenate, longer than the sepals, pale with purplish spots. Spur obtuse, ascending, and shorter than ovary.

THIS orchid, an occupant of rich meadow-land, is readily distinguished from any other by the green veins which mark the upper petals, and from which the popular name of green-winged Orchis is derived. It is, however, not unfrequently confounded with the green-leaved form of *O. mascula,* more especially when in a young state; indeed, when the plants are destitute of flowers, the differences are by no means easy of distinction, even to those who are perfectly familiar with the plants. On a close examination, the leaves of *O. morio* are found to be narrower and more acute than those of *O. mascula,* and with a slight silvery hue; but this latter is most noticeable in young plants, and less so when advanced in growth. To me the plants of *O. morio,* when compared with *mascula,* always appear, if I may use the term, somewhat dull, as if grown in a field adjoining a dusty road or path; but this is always most apparent in full-grown specimens. It is a rather diminutive plant, rarely exceeding a foot in height, but more generally three-fourths that size, and with from six to ten pretty purple and white flowers very loosely placed upon the stem. It is one of our earliest species to start into growth, the foliage frequently appearing above ground during winter, although the flowers do not expand till about the beginning of summer. This plant is readily cultivated, but should be planted on a rather dry eminence amongst good loamy soil. There are several very distinct forms of this plant as distinguished by the colour of flowers; one of these being white, another pink, and another deep violet. The popular names of this orchid, which are many and rather perplexing, have at various times formed the subject of comment. There can, however, be but little doubt that Shakespeare alludes to *O. mascula,* and not to *O. morio,* as one of the flowers which helped to compose the garland of Ophelia:—

> "There with fantastic garlands did she come,
> Of crow-flowers, nettles, daisies, and *long purples*
> That liberal shepherds give a grosser name,
> But our cold maids do *dead men's fingers* call them."

The commonly-accepted name of *O. morio*, the buffoon orchis, is in my opinion misapplied, the Greek word *μόρον*, a mulberry, being equally as applicable as *μωρός*, a fool, and there is certainly some sense in calling it the mulberry-coloured Orchis. In Gerard's *Herbal* (p. 208), where a whole chapter is devoted to this orchid, the flowers are described as being " in shape like a fool's hood or cock's combe, wide open or gaping before, and as it were crested above with certaine eaves standing up by every side, and a small taile or spur hanging downe." This description is, however, rather "far-fetched," and might in the same way be applied to most species of Orchis.

O. morio is, in company with *O. mascula*, called king's fingers, as will be seen on referring to Miss Baker's *Northamptonshire Words and Phrases.*

In some of the southern English counties this orchid is pretty abundant; but not so in Wales, at least the northern parts, although I have occasionally come across specimens, but never in quantity, in the meadows and downs of Carnarvonshire. It decreases in quantity as we approach north, until in Scotland it is, I believe, entirely wanting.

O. conopsea (fragrant Orchis).—Tubers palmate as in *O. maculata*, but usually smaller in size. Stem 12 to 20 inches in length, with narrow lanceolate, unspotted leaves. Flowers mauve-coloured, but subject to variation, very fragrant, and arranged in an oblong or cylindrical spike. Lip divided into three entire, equal-sized lobes. Spur cylindrical, very slender, and about double the length of the ovary.

The beautiful mauve-coloured and deliciously-scented flowers, as well as long slender spur, of this orchid are strikingly remarkable, and at once render identity an easy task. It is usually found in upland heaths and pastures, growing in rather dry loamy soil, but is strangely uncertain as regards choice of soil and situation; for it is occasionally found in damp marshy ground or morasses where one can hardly tread, and there attaining a size and luxuriance rarely equalled on the drier hillsides. I have frequently met with this orchid in mountain meadows or pasture land, growing on the raised mounds of soil that had been thrown up when surface-draining the land. Where found it is usually pretty abundant, but local in its distribution, and seems to prefer a calcareous soil. The whole plant is from 12 to 18 and sometimes as much as 24 inches in length; but the latter height is rather unusual, and only attained under very favourable circumstances. As a garden plant, it is very desirable, and may be easily grown in a mixture of loam and lime rubbish; but the latter is not really necessary for the successful cultivation of this somewhat variable plant, for by far the finest specimens I have seen were sent me from a damp, heathy shooting ground in the north of Ireland. In Britain *O. conopsea* is pretty abundant, more especially Scotland, where in Dumbartonshire it grows in great quantities.

There is a white-flowered form, but it is extremely rare.

O. militaris (military Orchis).—Tubers entire, resembling those of *O. mascula.* Leaves ovate or oblong, and more acute than in the nearly allied *O. fusca*, and the flower destitute of the dark ribs or markings that are so characteristic of that species. Lip of a pale purplish white, three-parted and narrow, the middle one two-lobed and blunt with a point between. Spur short, straight, and hardly half the length of the ovary.

This is a very showy plant, with a rather dense, oblong spike of reddish-grey flowers, marked with darker stripes and spots. It is a rare British species, being confined to a few of the southern English counties bordering on the Thames, and there chiefly in limestone or chalky districts. When fully developed in favourable situations, this handsome plant often reaches nearly 2 feet in height, with broad, acute leaves of from 4 to 5 inches in length. It is readily cultivated, but, as well as all those species confined to chalky downs or limestone districts, requires a little care in planting, otherwise success cannot be relied upon.

In planting, place the tubers between pieces of limestone, and fill up with soil composed of loam and chalk, varying the latter in quantity according to the requirements of the different species. It flowers in May and June, much depending on the season whether late or early.

O. fusca (brown-winged Orchis).—Tubers oval, leaves broadly lance-shaped, of a pale shining green, 8 inches in length by fully 1 inch in width, the lower ones usually resting on the ground. Flowers in size and structure somewhat resembling the latter species. Sepals dark brown and converging, forming a helmet-like hood to the flowers. Lip broader than in *O. militaris*, three-lobed, with the middle one notched in a rather irregular manner. Side lobes long and narrow.

Like the last species, this is a rare and beautiful plant, and one that is well worthy of a place in any garden, even in the most restricted collection.

The flowers form a compact, elongated head of nearly 4 inches in length, surmounted on a stem fully a foot in height. They are of a dark purplish-red colour, very conspicuous, and continue in perfection for nearly a month. In this country *O. fusca* is chiefly confined to the chalky woods and downs of Kent, but it is now, like many other native orchids, becoming fast extinct in the few places where it was known to exist.

Although occasionally offered in choice nursery lists, it is very difficult to obtain a true specimen of *O. fusca*, those sold by dealers generally turning out to be inferior continental forms. I have cultivated the true *O. fusca* very successfully by using fine red loam, and placing a handful of rough grit or sand round the tubers at time of planting. It should have a rather elevated position, such as on low rock-work, a damp situation or stagnant moisture being inimical to its growth.

O. ustulata (the dwarf or scorched Orchis).—Tubers oval and entire. Stem seldom 6 inches in length, more usually 4 or 5 inches, angular, and surmounted with a dense head of from thirty to fifty flowers. Flowers of a deep purple, which when expanding give to the plant a somewhat scorched or withered appearance. Lip with three divisions, the two outer spear-shaped and notched, the middle one longest with two short lobes and an intermediate point. Spur deflexed, blunt, and very short.

In this plant may be readily detected a miniature copy of *O. fusca.* The leaves are few, usually five or six, spear-shaped, and of a pleasant green colour. It is a native of dry, hilly pastures and fields, and is very abundant in some parts of England, but wanting in Scotland and Ireland.

I have never seen it wild in Wales, although our dry hillsides seem to offer no small amount of temptation. On various occasions kind friends have sent me unusually fine specimens of this orchid; but, although I went to a good deal of trouble in planting, they never reappeared after the first year. It flowers in May and June.

(*To be continued.*)

MADRAS AGRICULTURAL DEPARTMENT.

AMONGST other items in the *Annual Report of the Department of Revenue Settlement and Agriculture* for 1883–84 of Madras, we observe that the Forest Department has during the year directed its attention to the reclamation of sandy wastes on the coast by the planting of sand-binding creepers and other means. Three acres of the farm have been planted with *Divi-divi* (*Cæsalpinia coriaria*). A large quantity of Eucalyptus seeds imported from Queensland have also been distributed. The Australian Salt bush (*Atriplex nummularia*), as well as native indigenous salt-feeders, useful in reclamation of saline soils and for fodder, have been successfully cultivated. The Government Farm and School of Agriculture at Saidapet has hitherto been managed by a single officer acting both as superintendent of the farm and principal of the school. But as this system of dual control did not work well, the two institutions are now placed under separate management. Mr. Gamble is of opinion that should a demand arise for the bark and pods of *Acacia arabica* or Black Babool, a large trade in them might be developed in this Presidency, as the tree grows freely throughout it, specially in tank-beds and in black cotton-soils, where other trees do not thrive.

LETTERS TO THE EDITOR.

THE TREE CONUNDRUM.

SIR,—I enclose some guesses for the very excellent "Tree Conundrum" in your last issue. A few of them I cannot make out; had I been able to do so, I would have arranged them in rhyming order.—Yours respectfully, LILLIAN KING.

IVY COTTAGE, BULSTRODE PARK, SLOUGH.

1. Pear tree. 2. Caper. 3. Beech. 4. Spruce. 5. Tulip. 6. Bay. 8. Judas. 9. Fir. 10. Pine. 11. Date. 12. Weeping Willow. 15. Aspen. 16. Upas. 17. Locust. 18. Plane tree. 19. Crab. 20. Yew. 21. Apple. 22. Cocoa. 23. Plum. 25. Dogwood. 26. Spindle. 27. Sevice. 28. Bamboo. 30. Mountain ash. 31. Sloe. 32. Elm. 33. Lignum vitæ. 36. Cork tree. 37. Mystery. 38. Elder tree. 39. Poplar. 40. Alder tree. 41. Birch. 42. Lime or Ash. 43. Coffee. 44. Palm. 45. Iron. 46. Night-shade. 47. Industry.

[We reserve our complete answer till another issue.—ED.

AN IRISH CUPRESSUS MACROCARPA.

SIR,—I had recently occasion to cut down a magnificent *Cupressus macrocarpa*, and the many remarkable qualities it exhibited leads me to believe that it is a species worthy of a much more extensive cultivation than it has hitherto received. The tree was planted about twenty-eight years ago, and considering the quality of the soil in which it grew, and the bleak, exposed character of this part of the country, it attained to wonderful dimensions in this limited time. At 2 feet from the ground it girthed exactly 7 feet, and was as near as possible 50 feet in height. Its timber, too, is exceedingly close-grained, and is particularly rich in resinous matter, which is well known to be an indispensable requisite to fir and other timber of this class where durability, exemption from insect attacks, fungi, etc., are deemed important. I have not the slightest doubt, had this tree been allowed to stand until it reached maturity, its timber could not have been surpassed. This tree, however, does not succeed so well when planted in close proximity to the sea as some imagine. On an adjoining property, which is distant about 1½ miles from the sea, and where it has been extensively planted during the last thirty years, comparatively few good specimens exist; which are generally in positions from which they have derived considerable shelter from trees surrounding them. Those that are fully exposed to the sea-blast present that weather-beaten, one-sided appearance which characterizes most of our forest trees in that region. IRISH FORESTER.

A FORESTERS' ORGANIZATION.

SIR,—In your last issue, you ask us to petition in favour of Sir John Lubbock's motion. But the debate in the House of Commons has been successfully achieved without a single petition being presented. Now that a Select Committee is about to sit, surely working foresters should be stirring in their different localities to collect suitable evidence for its consideration. If they don't, John Thom and Harry James cannot grumble if German and French professors are the chief witnesses who will recommend continental methods not practically suited to British forestal peculiarities. Again, I don't know that it is within Mr. Maclaren's duties to circularize the members of the Scottish Arboricultural Society as to the expediency of instituting a Foresters' and Gardeners' Benevolent Institution. The constitution of the Society specifies aims altogether apart from this. In fine, a new organization appears needed for such objects as the purposes I have indicated, leaving the Society to pursue its proper course of educational meetings, publications, and excursions. Some of your readers might take up their pens to draw out the scheme of such a new association or convention. The farmers' granges of America rise to my mind's eye; but the subject is too great to begin at the fag-end of a letter.—I am, etc.,

THUNDERBOLT.

NOTICES TO CORRESPONDENTS.

FRANK T. HUSSEY, Taunton.—You may be interested in the experience of G. M. Burtis, who writes to the *New England Homestead:*—I have used dynamite or giant powder for removing stumps and rocks for years with good success. I can hardly give sufficient instructions by writing, as there are hardly two stones or stumps that require the same treatment. One stone would want a hole made under it with a bar, and the cartridge inserted with a capped fuse, and the hole filled with water or mud to exclude air. Another might be better to put the charge on top, and cover with mud. There is no drilling to be done. It needs care in handling, preparing, and using, but is not necessarily dangerous if used right. I would advise those contemplating using dynamite to get an expert to come and teach them its use, as it will be safer and cheaper in the end.

MR. J. R. FREEMAN wants a thoroughly practical book "on the valuation of growing timber plantations, etc." Are any of our readers acquainted with such a treatise?

REVIEWS OF BOOKS.

The Journal of the Royal Agricultural Society of England. Second Series. Vol. xxi. Part I.—April 1885. London: John Murray.

THE mechanical novelties already legion in connection with the utilization of live-stock food from silos, are conspicuous in Mr. Bell's report on the Miscellaneous Implements exhibited at the Shrewsbury Show. Our agriculturist readers will not pass over Sir John Lawes' exposition of Sugar as a Food for Stock, nor Mr. Ling Roth's report on Franco-Swiss Dairy-Farming. The medallion portrait of the late Dr. Voelcker, incorporated in the text of Dr. Gilbert's obituary, recalled to us impressions made long ago in the laboratory of the late Professor George Wilson in Edinburgh. His present biographer only well portrays how the thoroughness, practicality, and Christian character then apparent ripened through a useful life. Mr. Little's summary of the report on Agricultural Education in Europe, as well as Professor Fream's report on Canadian Agriculture, contain forestal items to which we may elsewhere refer. Meanwhile our readers may be interested in the concluding portion of Mr. Little's essay on the Agriculture of Glamorganshire. While the demand for timber for the collieries is so great as to cause the imports to the port of Cardiff alone in 1882 to be 226,175 tons of pit-wood and sleepers, and 71,928 tons of deals and deal-ends, the local supply is insignificant. Landowners would do well to plant more of their mountain land. Of 23,687 acres already thus occupied, the greater part must be in coppices, which are grown chiefly in the northern districts and on the sloping hillsides, and which, when cut down and cleared after thirty years' growth, realize at present prices from £18 to £20 per acre. The stools are left to produce another crop, thus without any treatment giving a like result at the close of another thirty years.

Mr. Little has found that where Scotch fir, spruce, alder, oak, and birch have been judiciously planted on exposed situations on the hillsides, a clear income of 10s. or 12s. per acre has been the average result. The following figures of the average cost of planting are given:—

	Per Acre.		
Clearing the ground of rubbish, briars, etc., . . .	£0	10	0
Draining, viz., open drains, 30 in. wide at the top, and 6 in. at the bottom, ...	1	0	0
Plants (miscellaneous) and planting, . . .	6	0	0
	£7	10	0

"In favourable situations on the sides of the hills, larch of thirty years' growth, thinned three times (say in ten, fifteen, and twenty years) with 300 of the best trees remaining, is worth at present prices £30 per acre; the thinnings realize from £10 to £15 per acre, and pay for fencing, draining, planting, and cleaning the plantations. In the bottom of the glens, whither the soils from the adjoining heights gravitate, oak, ash, elm, and sycamore develop into large timber trees, if allowed to occupy the ground for sixty or seventy years, and yield an income of 30s. per acre per annum."

Transactions of the Highland and Agricultural Society of Scotland. Fourth Series. Vol. xvii. 1885. Edinburgh: W. Blackwood & Sons.

AFTER two elaborate prize essays on the "Agriculture of Lanark and Wigtown shires," follows a dissertation of seventy pages on the "Woods, Forests, and Forestry of Ross-shire," by W. F. Gunn, containing so much that is interesting to our readers as to merit their careful study. By the Board of Trade returns for 1882 there were 43,201 acres under wood, giving Ross-shire the fifth place as a wood-growing county in Scotland. The best hardwoods are to be found on the sandstone and shaly rock, and the best Scotch fir and larch on the conglomerate and gneiss. *Pinus pinaster maritima* suffered least when grown as a shelter tree along the coast. Mountain ash and birch affect the light soils above gneiss rock; while natural birch springs up all over the hills where there was little or none before. The Pinaster, so useful for sheltering young plantations on high ground, is only planted in a limited way. High railway rates keep down the prices of larch and fir, practically precluding their transport to southern manufacturing centres. The larger sizes of larch have decreased in value from 2s. to 1s. 6d. within the last seven years. The Government Board of Trade now brand fish barrels made of spruce and Scots fir, though allowing larch barrels to be rebranded a second time. Large fir fetches from 8d. to 10d. per foot, chiefly for railway sleepers. Good ash fetches 1s. 6d. per cubic foot. Not much oak is sold. The cost of slit planting averages about 8s. per acre for labour alone. Scots fir suffers to a very limited extent from the caterpillar, beetle, and weevil. The larch has to contend with the larch bug, *Coccus laricis*, and other maladies. Overstraining of the tap-root induces tree decay in exposed localities. But the essayist records splendid hardwood, some trees being 100 feet high, growing in this supposed barren north-eastern boundary of Scotland, as well as thoroughly-attested instances of the introduction of ornamental varieties: a course which should be greatly multiplied. Our waning space allows only, meanwhile, that we note amongst other essays those of Mr. Hutchison of Carlowrie "On *Picea pectinata* (Silver Fir)," and "On the Disastrous Gales of Season 1881-82, and their Destruction to Trees."

The Forest Flora of South Australia. By J. E. BROWN, F.L.S., Conservator of Forests for the Government of South Australia. Part V. London: Trübner & Co., and W. Rider & Sons.

THIS new fasciculus continues to add lustre to the fame of the lithography and printing of the South Australian Government artisans; while the author, as formerly, combines popular interest with high scientific merit. In our drawing-rooms, or public library reading-rooms, we may now leisurely inspect the scenic aspects and botanical details of the strange Australasian flora by means of folio plates, coloured and tinted so as to imitate nature, with accompanying letterpress. The cost, alongside that of the monographs of twenty years ago, is analogous to that of the cheap newspaper press. In the present number are pictures and descriptions of the red and white Mallee (*Eucalyptus gracilis,* Mueller), types of the tree rising from one root, which is indeed apparently a kind of dwarfed trunk, forming a large proportion of the forests of South Australia; the blueberry tree (*Myoporum insulare,* R. Brown), an excellent plant for seaside covers, whose berries, which are really purple, are edible with a salt flavour. The bottle-brush tea tree of the lithograph (*Melaleuca squarrosa,* Smith) explains why bushmen invented its first name, while the second refers to its use as a beverage in the early colonial days. Several "salt" and "fresh water" tea trees are known to shepherds, and are good indicators of the nature of the water to be found in the adjoining soil. The poison-berry tree (*Pittosporum phillyræoides,* De Cand.) is depicted as something like a myrtle, but, so far as its seeds are only bitter and not poisonous, belies its popular name. It grows on arid sandy deserts inimical to other vegetation. In dry seasons herds flock under its shade. The tree grows from 15 to 30 feet in height, with a diameter of about 8 inches at its base. Its stem is two-thirds of its entire height, while the tree standing out in solemn grandeur relieves the monotony of the sandy desert.

WE understand that the Memorial volume of Essays and Reports in connection with the Exhibition is now mostly in type.

Annuaire des Eaux et Forêts pour 1885, *contenant Le Tableau complete au* 1^er^ *Avril* 1885, *Du personnel de l'Administration des forêts, du service forestier de l'Algérie, la liste des promotions de l'Ecole forestière, le budget de l'Administration des Forêts et de nombreux documents statistique,* 24° *année.* Paris: Au Bureau de la Revue des Eaux et Forêts, 1885.

THIS little duodecimo annual, issued only to the subscribers of our French contemporary *La Revue des Eaux et Forêts,* whose two recent issues contain some valuable forestal papers, the gist of which may soon be laid before our readers, has no representative in the English language. Its contents no doubt cater for the special needs of the great French forest service; but they indicate a plan of collecting yearly a mass of geographical, statistical, personal, and other items, which would undoubtedly be of service to the great English-speaking brotherhood in one way or another interested in wood or woodlands. In 1883, the number of forest agents acting on the *système* Lorentz was 807: this was augmented to 845 in 1884, and reduced to 836 in 1885; but in 1865 there were 955 forest agents, while in 1875 there were only 880 agents, including the crown foresters. In 1884, there were sixteen agents retired; but in 1885, no fewer than fifty-six.

The Indian Forester. April 1885. Roorkee and London.

BESIDES other Indian articles of much interest to foresters, this number contains, in full, Colonel Michael's report on the Indian section of Edinburgh Forestry Exhibition, which, amongst other most satisfactory items, shows how the Colonel effected a saving of about £125 out of the £575 sanctioned. Mr. Cole, the assistant, well known at the Exhibition, receives due praise.

The Journal of the Society of Arts.

NUMBERS for April 10th and 17th contain the prize essay by Mr. Jackson of Kew, "On Substitutes for Boxwood," submitted to the Committee of the late Forestry Exhibition.

THE Rev. Dr. C. Brown is about to issue another volume of the forestal series published in commemoration of the Edinburgh Forestry Exhibition, entitled *Forests and Forestry in Poland, Lithuania, and the Ukraine,* with notices of the timber exported from Memel, Dantzig, and Riga.

FOREST WORK FOR THE MONTH.

ENGLAND.

“THE leafy month of June” begins the summer quarter of our seasons. Let us hope it may this year maintain its character for pleasant and genial weather, which we will greatly enjoy after the chilling airs of the three preceding months. The mean temperature advances about 5° in June, and the rainfall usually averages about the same as in the preceding month. The recorded rainfalls of June 1884 were as follows:—

At Greenwich,	rain fell on	8	days, to a depth of	1·13	inches.
At Edinburgh,	,,	7	,,	0·96	,,
At Glasgow,	,,	13	,,	1·10	,,
At Bristol,	,,	9	,,	3·86	,,

Bristol district receiving, as usual, an extra share of pluvial favours.

The cold winds of March and April greatly retarded vegetative activity, and delayed the bark harvest until May began. Since then, stripping has been conducted with great vigour in the south of England; the bark mostly running easy, but the prices offered by bark merchants and tanners become annually “smaller by degrees, and beautifully less.” This season the New Forest sales have only averaged about 65s. or 67s. per ton, in place; and this is the price which an amiable and obliging tanner holds up to the anxious disposer of this product of the “harvest of the forest,” for a radius of many miles around this centre of these annual sales.

ORCHARD.—Examine grafts, and slacken the tying where necessary. Summer pruning is sometimes necessary amongst apple-trees, but leading shoots should seldom or never be meddled with in summer.

FENCES.—Clean out all weeds from hedge bottoms, and cut away all rank-growing grasses and weeds from young hedges, before their seeds ripen and fall. Hedges in certain prominent and particular positions may now have their first cropping or trimming, to be followed by another about the beginning of August, and the final dressing about the end of September. Insects become very troublesome to grazing stock about this time, causing them to rush about, much to the detriment of weakly-constituted fences. Those around pastures should be regularly examined, and all weak parts strengthened as they are observed. When cattle once make a break in a fence, they soon after find out all other weak parts, and prove their insufficiency.

PLANTATIONS AND PLEASURE GROUNDS.—Lately-planted ornamental trees and evergreen shrubs should be well watered, and have their supports examined and strengthened.

Large or important trees, intended for future transplanting, should now be prepared for this operation by shortening straggling branches, and training the roots to be lifted with moderate-sized compact balls. To do this, cut a trench around each root, at a distance from the bole proportionate to the size of the tree, and deep enough to cut all the rootlets. Fill this trench with fresh rich soil, or compost, or any other matter that would stimulate the rootlets, and upon which they could feed and flourish for a year or more, until their removal is desired.

Prepare for autumn planting by fencing the ground, draining, laying out rides, and forming roads throughout the intended plantation. Pits may also be made for the larger plants. Plantations made last winter should be gone through after rains, to tread up loose plants, and set upright those swayed over by winds.

Roads and walks on which weeds appear may have these destroyed by watering with a solution of carbolic acid; strength about one part of acid to forty parts of water will generally be found sufficient; but care must be taken to keep this mixture from contact with box, grass, or live edgings of any kind, for it is no respecter of vegetable substances, but is eminently destructive to all vegetation with which it comes into contact. When further diluted, this makes an excellent dressing for seeds before sowing, to destroy fungoid germs, and prevent the ravages of birds and mice.

NURSERY.—Sow seeds of the Wych elm in the early part of the month. Collect them fresh from the trees, and sow at once. In dry weather, water the beds regularly until the seeds germinate, then shade from the sun and from night frosts. The seeds of this elm may also be gathered and dried, and retained for sowing in February and March. Keep the hoe and rake going against weeds, and stir up hard ground between the rows with a light spade or the digging-fork. Weed seed-beds, and prick out evergreen seedlings in favourable weather, and water them regularly.

Turn over compost heaps, and mix their contents while turning, chopping lumps into small pieces. This will hasten decomposition of the compost matter, and prepare them for earlier application. Apply lime in its hot and powdery state to bare fallows, at the rate of about 56 lbs. per perch. It is an excellent application for reduction of the refractory constituents of the soil.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

NOT only in every country, but in almost every county or estate, the work of forestry, or perhaps more properly speaking forester's works, vary so greatly that it would be almost impossible to enumerate or describe them. The works of forestry, pure and simple, ought probably to consist only of the culture of forest trees. As it is, however, most foresters have to discharge many other duties besides those of forestry, and do whatever is laid to their hands.

Oak-bark peeling should by this time have been finished, and the drying and storing of it now engaging all hands. One thing to be specially observed is, that the bark be thoroughly dry before stacking or storing in the barn, grain loft, or other place of keeping.

Larch may still be peeled, and the same precautions are applicable to it as to oak in regard to drying. It must neither be stored wet, damp, nor put in a close or damp place: better spoil outside than in.

One and the best form of pruning may now be practised, namely, disbudding or pinching off the ends of the young shoots. This has the threefold advantage of being at once cheaply and expeditiously done, leaving no unsightly marks behind it, and doing little or no harm to the tree itself.

Young hedges which had been dug over in winter will now require to be well raked, both in order to keep down the germinating weeds and to close the ground so as to retain the moisture. Draining in general, and especially making and cleaning ditches with much water in them, can now be done to greater advantage than in winter.

All gate painting, varnishing, and tarring palings and fences in general may now be done to great advantage. All ivy and evergreen pruning in general should be finished as soon as can be done. General fencing should now be completed, whether wire or other kind of fencing, except perhaps turf dykes, which are better done earlier, in order that the turf may take root and grow before the dry weather sets in. The nursery should now have close attention, and both the hoe and rake kept going. In an old-established nursery after the first hoeing, where the weeds are very troublesome, what often answers better than repeated hoeing, is to dig or point over the ground with the spade. This of course cannot be done amongst very young plants, and where the rows are close. On the general borders and amongst older and advanced plants, where there is no risk of cutting thin roots, it can be practised with great advantage; and it will be found that pointing or surface digging pays well, as thereby the weeds are much longer in coming up again than they are after hoeing; therefore, though the pointing costs more per acre, yet, in a season's cleaning, it costs considerably less the one way than the other.

All fancy and rustic pieces for seats, porches, bridges, and other ornamental works of the kind, should be selected, peeled, and carefully dried and seasoned. This is very difficult to do in rainy or moist weather, in consequence of the tendency of the wind to contract mould or mildew, which, although it may be rubbed off by means of a cloth and fine sand, or other more elaborate and expensive means, yet all such rubbing, apart from the trouble and expense, tends to break the fibre and spoil the beautiful natural surface of the wood. Preparing the wood and making charcoal is a work of no small importance or magnitude on many estates, and should not be delayed till too late in the season. As the charring requires constant attention day and night, during the whole process of burning it is better to do the work while the nights are short and the days long. Grass roads, as they are termed, should be levelled and smoothed, grass seeds sown when required, and the surface thoroughly rolled. The prospects of cones, beech, mast, acorns, and seeds in general should be noted, and insects and squirrels looked after and destroyed as far as practicable.

C. Y. Michie.

Cullen House, Banffshire, *May* 15*th*, 1885.

[In Mr. Michie's report for last month read *hatched* instead of *hitched*.]

WALES.

OAK-BARK stripping is now pretty well completed in this neighbourhood; but the season cannot be called a favourable one for peeling operations. With a continuance of cold winds, and frost during the nights, the bark has not run well. On the other hand, the season has been everything that could be desired for drying and harvesting the bark. Where the bark has been sold, it may be delivered direct from the ranges, otherwise it will have to be put into stacks or sheds, and made safe against unfavourable weather. With the removal of the bark, the oak timber should be dressed and removed from the plantations at the earliest convenience. By removing the timber at once, it will not interfere with any young shoots that may be thrown up from the stools. The branches should also be covered or removed at once.

Hardwood trees may be pruned towards the end of the month.

In performing such operations, it is necessary it should be done with great care and moderation.

Attend to fences of all sorts, keeping them in good repair, and painting or tarring where necessary. Young hedges will now require digging or hoeing, and cleaning, otherwise they will soon get bare at the bottom.

Young plantations will require attention in the cutting and removing of gorse, long grass, or other herbage, where they are in danger of choking the plants. In many cases it will be insufficient to clear round the plants.

Many evergreen trees and shrubs may be transplanted with success during the present month. In performing such work, it will be necessary to have good balls of earth with the roots, which should be exposed as short a time as possible to the weather. After planting, they will require attention as to staking and watering.

Hoe vigorously in the nursery during dry weather, and fork between the rows of young plants. As time permits, continue the clearing and preparing of ground for planting next season.

Keep carriage drives and walks clean, and mow grass lawns and pleasure grounds. LEWIS BAYNE.

KINMEL PARK.

OBITUARY.

MR. WILLIAM EVANS, for long assistant-secretary of the Botanical Society in its earlier days, as well as at the same time being curator of the Royal Caledonian Horticultural Society, passed away in the beginning of May. Mr. Evans was profoundly versed in topographical botany, and showed a most facile manipulative dexterity and taste in mounting plant specimens for the Herbarium.

On the 19th of May, the town of Stirling had a loss felt there, and generally amongst British botanists, by the death of Mr. ALEXANDER CROALL, curator of the Smith Institute, in his seventy-sixth year. Mr. Croall began life as a parish schoolmaster near Montrose, at the same time giving his spare time to botanical pursuits, in which he became so prominent as to attract the attention of the late Sir William Hooker, who selected him to prepare sets of the plants of Braemar for the Queen and Prince Albert, a commission executed to their entire satisfaction. But Mr. Croall's fame will rest in his joint authorship of British seaweeds, nature-printed, a work in four volumes. He was president of the local Archæological and Natural History Society, doing much to kindle enthusiasm for work amongst the members. Dr. Smiles has given a sketch of Mr. Croall's career in his new work, *Men of Invention and Industry*.

CHIPS.

Trees growing through a Tombstone.—With a friend of mine, I visited a place called Lucien, in Hertfordshire, about eighteen miles from London, to see, as was said, " the greatest curiosity ever heard tell of," situated in Lucien churchyard. There we saw seven ash and three sycamore trees growing through a tombstone out of a grave. The stone was about twelve feet long, six inches thick, and eight feet wide. The growth of the trees had split the stone in all directions. Some of the trees at that time were seven inches through, and about fifteen feet high. The grave lot was enclosed with an iron fence twelve feet high, and the branches of the trees and some parts of the trunk had grown into the fence in all imaginable shapes and forms. Of course, there is a " true story " connected with the circumstance, as the people of Hertfordshire will strongly affirm. The person buried in this grave was a lady of title, Lady Anne Grimstone, who was buried there somewhere about a hundred years ago. She was an unbeliever in a Supreme Being—in fact, an infidel—and those who doubt it can buy a book, sold by pedlars for sixpence, strongly confirming the horrible story in detail. This lady asseverated previous to her death, that if there be a God or devil, a heaven or hell, she hoped ash and sycamore might grow through her body. No one planted these trees there, and the people religiously believe that to prove to the living the horrible heresy of the dead, the trees came from her body, and the more to attract attention, have grown up through and broken the stone.—John Wooding in *Gardener's Monthly.*

The Lanarkshire Orchards.—Mr. Tait informs us in his prize essay in the new issue of the Highland and Agricultural Society's *Transactions*, that the characteristics of these orchards, which are more extensive than of old, are changing. There is now less tree fruit raised, but more gooseberries, with a great trade to Glasgow and other jelly factories, which are often planted on land leased for 19 years, at a rent of £5 per acre, after the first year or two.

A disclosure of buried trees in Dumfries was made at the gasworks in the heart of the town, when the foundations of a new gasometer were being dug. The finds comprised a trunk of Scotch fir, six feet in height, with the bark upon it ; pieces of elm, oak, and hazel, with nuts and cones, broken antlers, as well as coleopterous remains.

Too Many Roots.—Edmund Hersey writes in the *New England Homestead*, that if selecting young trees to transplant he would reject those with large quantities of fibrous roots. Other practical men as well think that a tree stands better and grows better without such a mass of roots, which hinder its start off, retard its growth, and never allow it to become so strong as it would have been if deprived of them. A reason why the tree starts off better, the fibrous roots being cut away, is that the large roots immediately send out others ; whereas if the fibrous roots are allowed to remain a large portion of them die, and new roots are not started off.

New Caledonia.—Cocoa-nut trees exist in the colony in different varieties, nearly all having been planted by the Kanakas. Most of the groves are on the eastern side, where the majority of the tribes are to be found. This precious tree produces yearly from 50 to 80 nuts. The kernels, dried in the sun, are readily sold under the name of *coprah*, at from 300 to 350 francs (£12 to £14) per ton. This is the chief means by which the natives obtain the goods and luxuries of civilization. A few important groves are, however, held by Europeans. The other principal fruit trees are the orange, lemon, banana, canella apple, mango, guava and Shanghai peach. In spite of indigenous valuable timber, no important felling of trees exists in New Caledonia. The quantity cut is not even sufficient for the use of the colony, since New Zealand and Californian imported timber amounts to the yearly value of 500,000 francs (£20,000).

FORESTRY

JULY 1885.

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EDITORIAL NOTES.

THE SEASON.—It was the fashion in weather articles written during May to lament the long-delayed summer. Flowers and foliage, backward fully three weeks in the Edinburgh district, seemed to leap into joyous life in the first days of June. Up to the period we are writing, ramblers in the woods and fields have been gladdened by foliage of a fresher green than usual, as well as the greater perfection of flowering trees and shrubs. In the Botanic and City gardens the eye is dazzled and relieved by the variety of gorgeous colour intermingled with the untiring green of various shades. We purpose reverting to the most interesting items of tree growth in the various public parks of the district. Meanwhile our space compels us to limit our *notabilia* to Dalkeith Park and its surroundings.

Horse-Chestnuts have there been especially well displayed, including the double white, red, and yellow-flowered kinds, as well as the typical variety. The common Laburnum has this season presented a perfect shower of its golden blossoms. So, too, has the Scots Laburnum, a tree of less graceful habit, but with flowers as profuse and of a richer golden tint; while the *Laburnum Adami*, with flowers of different colour on the same branch, and with colour varying in most capricious manner, has been specially notable.

The show of Thorns, from the common Hawthorn with its sweet "May blossom," to the double varieties, such as the white, pink, red, and Paul's scarlet, abundantly testifies that these choicest of our flowering trees should be freely employed in ornamental planting.

Azaleas and Rhododendrons have flowered in their best form; especially where planted in woodland glades, where they are proof against vermin, they form an excellent cover, besides lightening up the scene in a manner unequalled by any other shrubs. So much for the natives of Dalkeith Palace woods. But an exotic now flourishes in the midst of their summer beauty, which deserves a special paragraph.

THE BLUE GUM OF TASMANIA AT DALKEITH.—Mr. Dunn, of the Palace Gardens, exhibited at the June meeting of the Edinburgh Botanical Society a branch with a number of unexpanded flowers of *Eucalyptus globulus*, taken from a tree, raised from seed sent from Australia in 1880. When about 5 feet high in the spring of 1882, it was planted out in a sheltered spot in light well-drained soil, where it has grown freely, and is now about 20 feet high. After passing through the recent two mild winters uninjured, it began to assume its full-grown foliage last season. The flower buds were first noticed about the middle of May last. So rapid has been their subsequent growth, that, with the continuance of a genial warmth, they may yet fully expand their flowers in July.

Ireland.—We can only note this month the propositions of Professor Howitz, of Copenhagen, made to the Select Committee of the House of Commons on Irish Industries, of forests from Giant's Causeway, down the western coasts, and thence even eastward, in all comprising 5,000,000 of the 20,000,000 acres comprised in the area of the Emerald Isle, profitably created at a cost of £20,000,000, of course by Government.

The Scottish Arboricultural Society. — After the annual meeting in Edinburgh, on Tuesday the 4th August, the two days' excursion will be to the Estates of Langholm and Netherby, through the courtesy of his Grace the Duke of Buccleuch, and Sir Fred. Graham, Bart.; and also to the Knowefield Nurseries, Carlisle, as well as to the estates of Lowther, Penrith. Full particulars as to trains and dates will be found in our advertising columns. Rarely has such an annual excursion combined so many attractions. The woods of Netherby alone are classical in arboricultural literature; and in addition there is the oft-praised scenery of the English Lake country.

EXHIBITION LESSONS ON TIMBER-PRESERVING.

THE title of Mr. Boulton's paper, "On the Antiseptic Treatment of Timber," read a year ago before the Institution of Civil Engineers, to which the Telford Medal was given, indicates the new current of ideas prevalent as to the theory and practice of creosoting timber. Mr. Bethell appears first to have applied coal-tar and its products to railway sleepers, with the notion that he was coating them as it were with a waterproofing composition. The chemical action of these odoriferous compounds on the albumen and other nitrogenous compounds in the wood, in preserving it from decay, was the next step in theory prevalent with chemists and kyanizers; whilst the modern theory of antiseptic treatment of living organisms prevalent since the magnificent researches of Koch and Pasteur appears to have displaced both such previous opinions. The discussion printed along with the paper is a repertory of facts and opinions supplied by the most eminent living railway and telegraph engineers, chemists and scientists. A careful study of it only goes to convince that after more than forty years' application of coal-tar oil injection into timber for preservative purposes, affording instances of marvellous successes and unaccountable failures, an ounce of verified theory would be worth a ton of practice. Visitors at the Inventories may study the exhibits illustrating Mr. Boulton's new patent for creosoting wet timber, to which the discussion referred. But before investigating either the elaborate model of the patent apparatus now used at Burt, Boulton, & Haywood's works, or any of the 36 diagrams and treated sleepers, and other timbers displayed in the South Central Gallery (East End) of the International Inventions Exhibition, they may suffer to be coached in a little theory—involving reference to the Japanese display of timber-preserving at the Edinburgh Forestry Exhibition, which, though attracting little attention from the mass of visitors, has been specially signalized as among the best items of this International Display by Professor Riley, in his report published in the *Annual Report of the American Commissioner of Agriculture*, as well as by Indian Forestry Department officers. We are indebted to a most practical article on the treasures of the Japanese Court in the May number of the *Indian Forester*, for the following reproduction of the description hung above the model of an establishment for preserving timber in a mixture of sea and fresh water, of which large numbers exist throughout the island-empire. Mr. H. Maudslay, at the discussion of the Engineers' Institution, noted how the decay of timber piles of the piers of Old London Bridge varied according as they were constantly under water, or exposed to water, air, and sun; or to salt water or to fresh water on the rise and fall of the tide. Large roots of red pine timber he had come across in excavations to form a reservoir on the Arran and Snowdon mountains, which must have been kept in the magnificent state of preservation they were found in for centuries, decayed on exposure to the air. So, too, tables made from the wood of the *Royal George*, sunk in 1782, appeared intact, though cast-iron cannon raised from the wreck were found to be soft as plumbago, were evidences of the preservative power of sea-water. Be it noted, then, that the Japanese use only wood previously preserved as follows:—

PRESERVATION PROCESS APPLIED TO TIMBER STORE.

At a distance of 20 or 30 chos (1 cho = about 120 yards) from the sea, and near the mouth of a stream, a large pond is dug, so that the sea may have free access to it. This is called Kakoitori (or storing pond). Its size is not fixed, but generally it contains an area of 14,000 or 15,000 tenbos (1 tenbo = about 36 square feet), and its owner keeps his office near by, so that he may transact his business on the spot.

The circumference of the pond is built of stone or wooden walls, and a canal is dug on one side to communicate with the river and thence with the sea; the flow of the tide being regulated by means of a sluice. The pond should not be deeper than 5 feet in the central parts at full tide, and not shallower than 2 feet in the margin at ebb tide. The right proportion of salt and fresh water for the pond is 6 parts of the former to 4 of the latter; for if the salt water exceeds this proportion, timber becomes blackish in colour, and is liable to be much eaten by worms; if, on the other hand, the proportion of salt water becomes less, it is much sooner decayed than otherwise.

The velocity of the flow of tide should also be very carefully regulated, for if the current is either too rapid or too slow, timber is again very liable to be much injured by worms. Hence, in those places where there are two or three ponds near one another, their owner generally amalgamates them, on agreement, by means of small canals, which arrangement regulates the flow of tide very considerably. Timber for storing is usually piled in five layers according to its quality; the lowest layer consisting of middle-class timber; the next layer of first-class timber, the next layer above again of middle-class timber; the next layer of third-class timber; whilst the uppermost layer, which is usually exposed above the surface of the water, consists of very low quality, and by its weight the lower four layers are kept sunk under water. Those five layers are piled one upon another alternately at right angles, so that the whole arrangement presents the appearance of a toothed cube. Sometimes, however, the pile consists of only two or three layers; in that case they are tied to a big timber (about 12 to 15 feet in length, and 7 or 8 inches in diameter) standing near by, and are thus prevented from floating about freely; sometimes also one or two separate pieces of different kinds of timber are kept in the pond for specimens. The durability of timber depends greatly on the amount of care bestowed on it, and to this end the washing is the most important. Twice in a year, generally in June or November, the cubical mass of timber above described is disengaged, and each piece is well washed by means of a straw brush. The different pieces are then reconstructed in a cube, but with the following alteration in the arrangement: the middle-class timber which before constituted the third layer, now forms the lowest layer, and the middle-class timber which in the former case was at the very bottom, now occupies the third layer. If washing cannot be done twice a year, it must be performed once a year at least.

In the following table are shown (in the first column) the names of different kinds of timber, in the second column the number of years for which they may be preserved in the timber store, and in the third column the period at which they are best adapted for use :—

I.	II.	III.
Hinokai (*Thuya obtusa*), .	for 8	after 3
Matsou or Momi (*Abies firma*),	„ 4	„ 1·5
Sugi (*Cryptomeria japonica*), .	„ 5	„ 2
Tsuga (*Tsuga Sieboldii*), .	„ 6	„ 2
Hiba (*Thuja dolabrata*), .	„ 8	„ 3
Tawara (*Thuja pisifera*), .	„ 8	„ 3
Reyaki (*Zelkowa Keyaki*), .	„ 8	„ 3
Kashi, „ „ .	„ 10	„ 4

(The number of years is calculated from the day of felling, and the time which is spent before timber comes to the store is reckoned to be one year.)

A pond of 15,000 tenbo in area can, on the average, store up about 10,000 pieces of timber. They are of various lengths, as the following table shows :—

Lengths of timber (in kens), 2, 3, 2·5, 4, 3·5, 4·5 5, 6,
Percentage number, . 50, 20, 10, 5, 10, 5, per cent.

Thus one-half of the whole timber in the pond is of 2 kens in length, one-fifth is of 3 kens in length, etc. (1 ken = 2 yards.)

At ordinary times, only three or four men are employed, whose daily wage is 35 to 45 kus (?), but at the washing season 15 men are employed daily for a period of about half a month.

BOULTON'S METHOD.

Convinced by a series of elaborate analyses, that to call the process generally introduced by Bethell for preserving railway sleepers "creosoting" was a misnomer, much of the so-called creosote being washed out by rain, snow, etc.; also that the solid products in coal-tar were really powerful antiseptics, Mr. Boulton has invented his new process, now exhibited at the Inventories, by which he has been able to remove the watery moisture in the timber present at the time of injecting the coal-oil. Railway sleepers should and usually are stacked and seasoned several months before being introduced into the cylinders; but timber of irregular sizes and large scantlings sawn from large logs previously kept in timber ponds, and which from being used in sea-water may be subjected to attacks of the *Teredo navalis* or the *Limnoria terebrans*, should have a very liberal dose of the liquid, is extremely difficult to treat in this manner. All previous artificial processes of drying, whether by currents of heated air, or by stoves in closed chambers, or by superheated steam in closed chambers, are subject to very grave objections. Mr. Boulton believes that timber cannot be heated beyond 230° F. with safety; as at a temperature much exceeding 250° F. the woody fibre begins to be decomposed, and the pyroligneous acids are distilled from it; while warping and twisting, as well as brittleness, are known to have been exhibited on timber stoved before creosoting. Mr. Boulton was led by numerous experiments to his new process, which is based on the great difference betwixt the boiling-points of water and of creosote; the temperature at which water begins to distil being 212° F., that of heavy oil of tar, commonly called creosote, ranging from 350° to 750° F.

Our author details his method:—

"The ordinary method of creosoting timber is familiar to all engineers. The timber is placed in a closed cylindrical vessel, an air-pump is set at work, which produces a vacuum in the cylinder, opens the pores of the timber, and serves to some extent (but by no means completely) to draw out the moisture therefrom. The creosote is then introduced into the cylinder, heated ordinarily to 100/120° F., *when the action of the air-pump is discontinued*, and the pressure-pumps are employed to force the creosote into the wood. This is the method of injecting antiseptic fluids, which was first used by Bréant, and adopted and improved by John Bethell and Henry Potter Burt. This process is perfect when the timber is dry, but if the timber be wet, it fails of its complete and adequate results.

"In my improved process I introduce the creosote at a heat *slightly exceeding* 212° F., *and I continue the action of the air-pump* after the creosote is introduced into the cylinder, the air-pump being made to communicate with a dome which is fitted on the top of that vessel. It will be readily seen that as the timber is thus subjected to a temperature above the boiling-point of water, *any watery moisture contained within the pores of the wood must inevitably be turned into vapour, and this vapour is drawn off by the action of the air-pump* through an ordinary condensing worm, the condensed moisture being received in a tank. On the other hand, the temperature of the creosote being much below that of its point of ebullition, that liquid is not turned into vapour. By this means, however much the timber may be soaked with water, it can be at once introduced into the creosoting cylinder, the heat for the expulsion of the water in the form of steam being supplied by the creosote."

In the cylinder used, the logs float on creosote which is heated as in a still. The water drawn from the wood is removed as vapour through a worm.

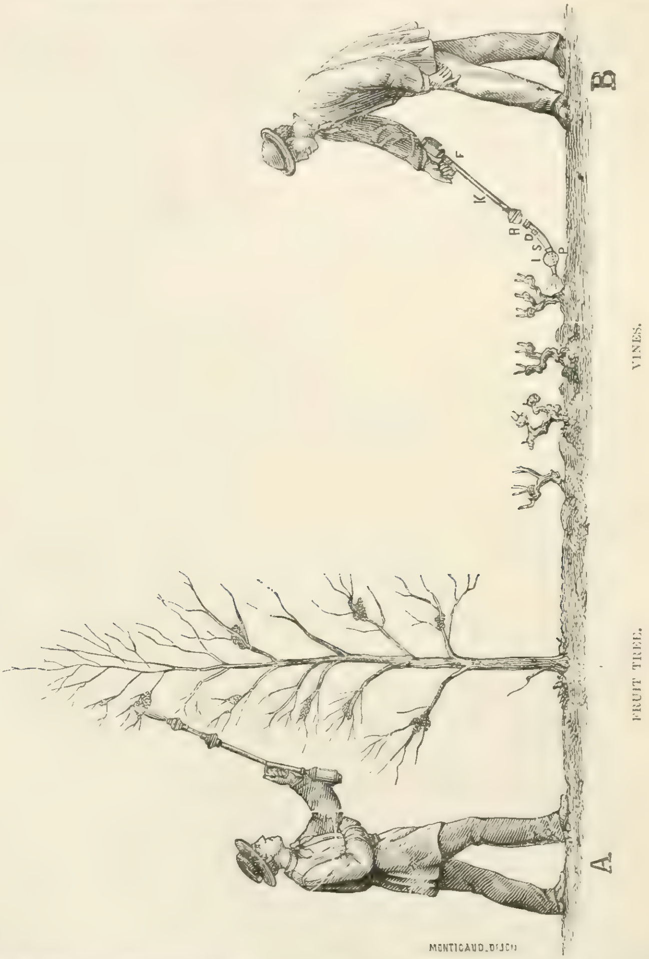
Examples of sleepers showing the advantages of the new process, as well as a telegraph pole treated by it, are exhibited at the Inventories. In the specimens Nos. 10 to 36 inclusive, which illustrate the comparative endurance of creosoted and uncreosoted timber, our readers may find an interesting study. Fences thoroughly good after thirty years' use, posts perfectly good though erected in 1855, beech sleepers from a parcel of 6890 creosoted in 1865–66 for the West of France Railway, 6545 of which were perfectly sound after nineteen to twenty years' wear, are amongst the items.

That beech is so employed on the Continent, the West of France Railway Company having used three millions and a half of these sleepers with like success since 1864, cannot but be interesting for landed proprietors in many quarters looking for a market for this wood. Again, it may be gathered from the discussion before the Institution of Civil Engineers, that previous preparation of the wood, rather than a high percentage of carbolic acid in the oil used, is of most importance in creosoting hop-poles, or palings for fences, preferably by this process.

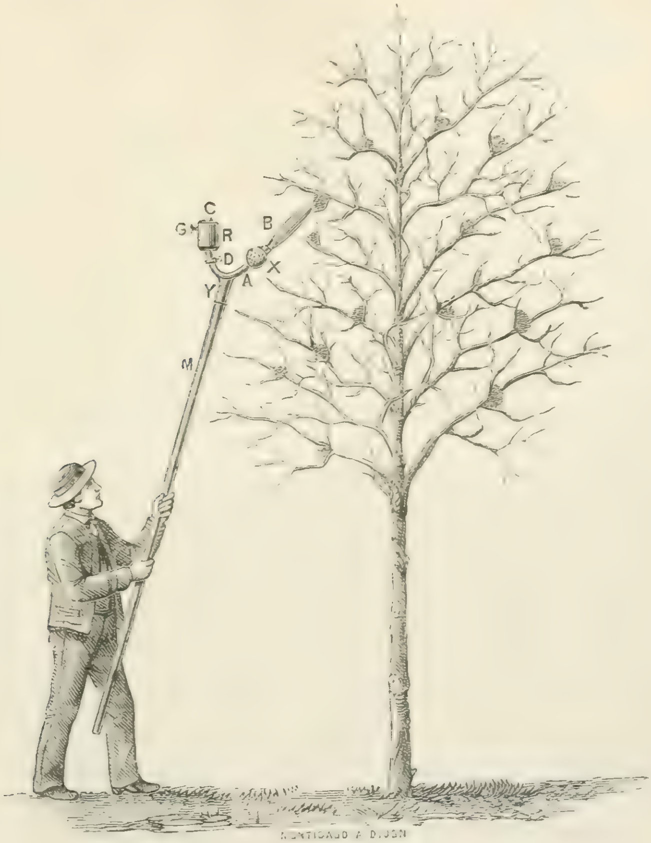
GAILLOT'S PATENT AUTOMATIC TORCHES.

THE ravages caused by the vine disease, and the destruction of crops by other insect pests in France, render their extirpation a matter of national importance. And as British foresters have also abundant reasons for sympathy with their *confrères* across the narrow strip of blue, an effective discovery bearing on this common calamity, though in different phases of manifestation, must have an equal interest to them.

The two great insecticides, apart from human destroyers, still are fire and poison. The first, dangerous to manipulate and control, often destroying not only the insect-infested tree, but valuable old timber surrounding it, is generally preferred to the use of chemical solutions which the insect may avoid, and which sometimes occasion the sacrifice of inoffensive lives. M. Gaillot, mechanical engineer at Beaune (Côte d'Or), appears, from the attestations of nearly two hundred medals and diplomas awarded at Phylloxera conferences and the like, to have invented an instrument satisfactory to the French vine-growers. Its purport is destruction not only to the thoroughly-matured insects, but even to their winter eggs, as well as other eggs, larvæ, and other undeveloped sources of tree destruction. Now why should not Scottish foresters determine a similar doom on the winter representatives of the Pine Weevil and its allies, whose ravages are commented on in another part of this issue? The instrument, as used in France on vines and fruit trees, is depicted in the hands of the workmen in the accompanying woodcuts. It is made entirely of metal and weighs little over 2 lbs. avoirdupois, cost in an iron case being about £2, 9s. It burns about 3 pints of petroleum spirit, costing the retail consumer say 4d. in a day, when the man using it should destroy at least 2000 insect eggs besides other noxious larvæ.



As many of our readers may have seen country mansions lighted up by a gas formed by a mixture of atmospheric air and petroleum spirit, they will be already aware that wicks such as are requisite in ordinary paraffin oil lamps are not needed for the use of this phase of the best modern instance that fire, though a bad master, may be a faithful servant. The reservoir of petroleum spirit in the instruments used by the two workmen of our first diagram, is the round projection just below their hands; and when the torch is held as by the workman at B, a few drops come to its tip, which on being lit speedily heat the whole torch, and the spirit vaporizes into the atmospheric air, admitted by an opening at the top of the reservoir behind the workman's hand; so a continuous gas supply is kept up, which may be used as the two workmen at A or B are doing. The flame is entirely under control. By means of a flame protector, young buds escape, when the larvæ below them are being destroyed. A perforated cylinder, at X in our second diagram, serves to direct the flame, and protect it against the violence of the wind. When the workman desires to cease operations, as at A and B in our first diagram, the torch is placed in a vertical position.



Our third diagram represents the instrument shaped like a fork atop a wooden pole, so as to operate on high trees. The reservoir R in this case is at one end, and the reticulated hood X at the opposite side of the fork X just beneath where the gas jet B issues.

The scientific principles of this instrument in its two forms are perfect; and the mechanical appliances necessary in successful practice appear ingenious and complete. Our readers will appreciate the services it may perform in British woods and gardens.

INTERNATIONAL BIRD PROTECTION.

NOT the least interesting of several important papers which comprise the last fasciculus of the *Bulletin* issued by the French Minister of Agriculture, is the Report by Dr. Custalet, who was deputed to attend the International Ornithological Congress held in Vienna on 7th April 1884. We can only refer to the topic of our title, which was one of the three subjects of discussion by the distinguished group of noblemen and scientists of various nationalities who then met in session, presided over by S. A. L. and R. Archduke Rudolphe. The paper occupies fully 28 quarto pages of the *Bulletin,* and is to be continued. Our references must be forestal and at random.

To the traps and snares spread by man for the destruction of the bird world, have lately been added fishes and electricity. In the neighbourhood of some towns in Central France, much game has been recently destroyed by strychnine; whilst near Marseilles the following ingenious trap was lately in full operation: a length of copper wire twined round the old branch of a tree and connected at its base with a Rhumkorf coil; whilst near this branch a prepared bird was perched on to the top of a pole to attract its *confrères.* No sooner had a great number been thus enticed on to the treacherous copper wire than the electric battery was set in motion, causing instant death.

But civilization has also originated indirect means of bird destruction; amongst which is the unreflecting destruction of trees. The insectivorous birds can thus find no resting-place and refuge from hawks. Lines of telegraph have been certainly prejudicial to passage of birds. Thus Dr. Elliot Cones counted in a space of three miles in Colorado, no fewer than an hundred birds killed by the wires. Then lighthouses serve to attract the migratory races to their destruction. Thus at Heligoland, which lies directly in the route of the birds of passage in their way from Africa and Central Europe to the far north, no fewer than 5000 larks have been captured in a single night; besides, rare species are obtained by the light-keepers throughout the year. Again, M. Nonay captured 125 dozen of insectivorous birds in the garden of a lighthouse during the month of April.

Some facts as to the work of birds whose destruction is seriously threatened will show their place in the balance of nature. The owl and screech-owl will destroy several hundreds of house and field mice in a season; a couple of sparrows will destroy 4300 caterpillars; a swallow will capture about 16,320 flies and gnats during the five or six months of its periodic visits; and a small group of tom-tits will, in fifteen days, rid the culturist of 5760 adult insects, grubs, and larvæ.

Our winged friends have not been without detractors. The English agricultural press lately bristled over with the sparrow controversy. But Macgillivray attributed the productiveness of the market-gardens surrounding London greatly to the aid of this bird; while M. Brehm says that the trees in the public gardens and squares of Paris flourish because of its similar services in destroying noxious insects. A like certificate of usefulness has come from New York and Philadelphia; while a cargo of the birds was lately shipped to Australia with similar intents. The starling has also been much spoken against, though the utility of no bird can be more easily proved. When the young ones are first hatched, the parents bring food to them in the morning every three minutes, in the evening every five minutes; so, during seven morning hours 140 slugs are consumed, to which must be added 84 for the evening meal; and thus, in the end, 364 slugs a day may be destroyed by a family of starlings. Provided with artificial nests, starlings, numbering in all 504, may destroy 55,250 slugs in a season. By wise planning on the part of a forester in the Grand Duchy of Gotha, the starlings have so increased since 1856 that 180,000 birds now daily destroy at least 12 milliards (600 millions) of slugs. On his journey to the Conference, through Wurtemberg and Bavaria, our reporter saw starlings' artificial nests, either on poles before the houses of the villages, or attached to the walls themselves.

We may return to the doings and recommendations, educational and legislative, of this Conference.

THE NEW ORLEANS EXHIBITION closed on the 6th of June. It has been a financial failure; and the United States Government, to whom it is heavily indebted, refuse their sanction to its being reopened in November.

JUNE LEAFAGE IN KENT.

At the present time the leafage upon nearly every species of forest tree is unusually heavy; and though the weather has on the whole been comparatively calm, branches have in many places fallen under their loads. The frosts in May cut back the young ash, Spanish chestnut, and some other trees, and quickly changed the colour of the budding larch. But these have now recovered, and the woodlands are unusually attractive. We had a genuine "blackthorn winter," and the beauty of the blossom was nearly everywhere destroyed. But by the middle of May the hawthorn (*Cratægus oxyacantha*) burst into magnificent bloom; somewhat too late to encircle the head of the May queen. In walking or riding along the highways and byeways at the foot of the Chalk Hills at the present time, the wayfaring tree (*Viburnum Lantana*) is everywhere conspicuous. Its drooping mealy branches and large heart-shaped leaves, surmounted by clusters of partially-formed green berries, destined during the coming month to present bunches of mixed scarlet and black berries, point it out to the traveller. And many an economical smoker constructs from the two- and three-year-old wood a stem for his pipe. Overhead the cones of the spruce hang thickly, and in many places these are of a deep purple colour. The elders are everywhere bursting into bloom, and give promise of an abundant crop. Pliny and Evelyn are both loud in the praises of this tree. The latter says that the inner bark applied to a burn takes out the fire at once; the buds boiled in water are efficacious in fevers and inflammations; and extracts from the berries are conducive to longevity. Certain it is that the elder ointment, tea made from the flowers, and wine from the ripe berries, are among the most popular of medicines and stimulants in rural districts. Though no longer in request for flutes and pipes, it is widely known as the "pop-gun tree." Tradition says that Judas Iscariot hanged himself on an elder tree. And the dense shade it affords makes it a fit companion for such trees as are emblematic of sorrow.

A. J. Burrows.

Pluckley, Kent, *June 22nd.*

TREE GROWTH.

Amongst the most interesting of many papers in the Forestry Reports of the United States, just issued under the supervision of Nathaniel H. Egleston in a volume reviewed elsewhere, is that by R. W. Furnas on the above topic.

Mr. Furnas found the annual growth of twenty different varieties of young timber planted by himself, and measured during a period of twenty-five years, to be very irregular; sometimes small, at others scarcely perceptible, and again quite large. This he attributes to irregular conditions. Some seasons are propitious, and others the contrary, as was indicated by the size of the concentric rings, especially in young trees. As trees increased in age, the inner rings decreased in size to almost entire disappearance or obliteration, at least to the naked eye. Diminished rate of growth, after a certain age, was found to be the rule. So much for observations made in South-Eastern Nebraska.

In recent investigations of Thomas Meehan, made during his tour in California and Alaska, and laid before the Botanical Section of the Academy of Natural Science of Philadelphia, he says:—"In order to ascertain whether more than one annual circle of wood is formed in each year, we tested the matter in various ways. For instance, a pine or spruce would be found to make an average growth of a foot a year up to 15 years old; from that on, 6 inches; after that, a stage was reached where the erect growth ceased to any considerable extent, and the growth force seemed turned towards the lateral branches. In the pine forests of the Pacific coast there was no danger of error in fixing the age of the average tree of 60 feet high at about 50 years. Whenever such a tree was cut down, and an opportunity afforded to count the circles, they would be found to correspond so nearly with the calculated age as to prove that it was quite safe to assume a single circle for a single year. Then there was a remarkable degree of uniformity in the diameter of these annual growths in most trees, so that when once we had the number of circular lines to an inch, and the diameter of the tree, we could tell its age near enough for general purposes. In some pine trees growing on very rich soil we have found as few as about 4 circles to an inch. For instance, a section of a *Pinus Lambertiana* in Mariposa, 4 feet across, had but 189 circles; but here the increased size of the trees correspond with the larger annual circles. Trees of this species of pine here measuring 30, and a few 33, feet round, were not uncommon. No matter, however, how vigorous may be the growth of trees under 50 or over 100 years, they decrease with age, and we may safely allow 6 rings to an inch in these older sugar trees, which would make the 33-foot tree 396 years old. The outer growths of *Sequoia* were very narrow; we counted as many as 18 to the inch, while the rings in the interior of cross-sections would show about 6 to the inch. Allowing 12 as the average per annum, a tree of 33 feet diameter would give 2376 years old, which is about the same as given by an actual count of the rings.

"At Harrisburg, or Juneau, in latitude 58°, a Sitka spruce (*Abies Sitkensis*) cut down gave 149 rings from centre to circumference—298 lines in a trunk 3 feet across. This gave an average of about 8 to an inch in this 149-year old 3-foot tree. At Wrangel, in latitude 56° 30′, a tree of the western hemlock (*Abies Mertensiana*) which had been blown down, and afterwards divided by a cross-cut saw at 4 feet from its base, gave 18 lines to an inch, and the annual growths seemed very regular, almost to the centre of the tree. It was 6 feet in diameter, and must have been a grand old tree in its day. It had evidently been broken off years before it was blown down, but the length of the trunk up to where it had been broken was 132 feet, and 4 feet in diameter at that height. But, allowing as much as 12 to an inch, it would give for the point cut across, 6 feet, an age of 432 years. At Kaigan Harbour, latitude 55°, the Sitka spruces were very large and of great height. We measured two of the largest, which were 21 feet in circumference each. Allowing 8 to the inch, as in the tree of the same species at Harrisburg, it gives 336 years as the age of the tree. So far as appearances went, these trees were in the height of vigour, and there seemed no reason, judging from experience in other cases, why they might not flourish for 100 years yet." Mr. Meehan had no doubt that these trees in these latitudes in Alaska would easily have a life of 500 years.

In contrast to this, trees famous for longevity in Europe are comparatively short-lived in the Atlantic States of the American Union, where 200 years is the average lifetime of a forest tree. Thus the English oak (*Quercus robur*), said to live 1000 years in its native clime, has grown to full size and died away in the old Bartram Garden near Philadelphia when little more than 150 years old. So silver firs (*Abies pectinata*) planted in the same vicinity in 1800 are decaying. This is the general experience. And the difference appears caused by the relative humidity of the atmosphere in the two countries. Evergreens, like *Cerasus, Lauro-cerasus, Laurus nobilis,* and *Viburnum tinus,* will endure a temperature of 25° below freezing-point in Great Britain, but are killed at 10° in Philadelphia. On the contrary, the climate of Alaska has the same favouring influences which influence that of Great Britain. The presence of the Warm Sea of Japan on its south-eastern border, where the great trees grow, a moist atmosphere, and almost no severe weather, winters where no ice is seen, all favour the longevity of trees.

HISTORICAL NOTICE OF SOME CELEBRATED TREES.

BY THE LATE PROFESSOR WALKER ARNOTT, M.D.

PART II.—THE YEW AND THE PINE.

THE YEW.

THE yew, *Taxus baccata*, if it does not attain to a great height, boasts of no inconsiderable bulk, and its perennial verdure, hardness of wood, its incorruptibility, exceeding slow growth, are so very striking characteristics as to point it out at once as an emblem and an example of immortality. Its branches were therefore employed by our ancestors in the north, in place of the cypress, to deck the graves of the dead, and for other sacred purposes. It attains a very great age. De Candolle says that he counted on a trunk only ½ foot thick, 71 layers or rings of wood. Oehlafeu counted 150 layers in a trunk 13 inches in diameter; and Veillard 280 layers in a section of only 20 inches diameter. From these De Candolle drew the conclusion that the trunk of the yew increases in diameter about one line—French measure, the 1-12th of an inch—during the first 150 years, and rather less than ¾ of a line for the ensuing 130 years. Hence he proposed to estimate the age of ancient yews by assuming a line per annum as their average growth in diameter. Their age would in this way be readily computed by measuring their circumference, and thence obtaining their radius in lines; the tree being reckoned as many years old as there are lines in diameter. Since all trees grow the more slowly as they advance in years, this estimate ought even to be corrected, making the trees still older than as calculated by De Candolle; but this, it must be confessed, leads to some startling conclusions. The computed age of the famous yews of Fountains Abbey, near Ripon in Yorkshire, is to a great extent sustained by the history of the abbey itself, as chronicled by Hugh, a monk of Kirkstall, whose narrative is still preserved, it is said, in the library of the Royal Society. This monastery, the noble ruins of which are now overlooked by the venerable trees that beheld its erection, was founded in the year 1132 by Thurstan, Archbishop of York, for certain monks, whose consciences being too tender to allow them to indulge in the relaxed habits of their own order, made them desirous of adopting the more rigid rule of the Cistertians, then recently introduced into England. "At Christmas, therefore," says Burton, "the archbishop being at Ripon, assigned to these monks some land in the patrimony of S. Peter, about three miles west of that place, for erecting of a monastery. The spot of ground had never been inhabited, unless by wild beasts, being overgrown with wood and brambles, lying between two steep hills and rocks, covered with wood on all sides, more proper for a retreat for wild beasts than for the human species. Richard, the prior of St. Mary's at York, was chosen abbot by the monks, being the first of this Monastery of Fountains; with whom they withdrew into this uncouth district, without any house to shelter them in that winter season, or provisions to subsist on, but entirely depending on Divine Providence. There stood a large elm in the midst of the vale, on which they put some thatch or straw, and under that they lay, ate, and prayed, the bishop for a time supplying them with bread, and the rivulet with drink. But it is supposed they soon changed the shelter of their elm for that of seven yew trees growing on the declivity of the hill on the south side of the abbey, all standing at the present time (1658) except the largest, which was blown down about the middle of the last century. They are of an extraordinary size; the trunk of one of them is 26 feet 6 inches in circumference at the height of 3 feet from the ground, and they stand so near each other as to form a cover almost equal to a thatched roof. Under these trees, we are told by tradition, the monks resided till they built the monastery; which seems to be very probable, if we consider how little a yew tree increases in a year, and to what a bulk these are grown." The largest of these trees was measured by Pennant in 1770, and found to be 26 feet 6 inches—in fact, precisely what Burton says of it in 1658; but Pennant's measurements may have been taken higher up. Assuming it as the more correct, we find the diameter to be 1214 lines, or a little more than 85 inches. And adopting the rate of increase as proposed, at 1 French line each year, this tree is supposed to be about 1280 or 1290 years old. The famous yew at Crowhurst in Surrey was in 1660, when measured by Evelyn, 33 feet in circumference, and is now (1846) calculated to be about 1475 years old. According to Evelyn, there was another in Braburne churchyard in Kent, which that year (1660) was 58 feet 11 inches in circumference, or 18 feet 11½ inches in diameter. Hence, applying the same rule, its age at that time could not be less than 2700 years; but this tree has long since disappeared. At Sutton, near Winchester, there was such another monster. The Ankerwyke yew, near Staines, a witness of the conference between the English Barons and King John, and in sight of which the Magna Charta was signed, measures 27 feet 8 inches in circumference, and should therefore be 1100 years old, about the age assigned to it by tradition. The Darly yew, in Derbyshire, had a mean circumference of 29½ feet, and would thus be about 1600 years old. In the woods of Cliefden, near Hedsor in Buckinghamshire, there are some extraordinary remains of yew trees, and there is one called the Hedsor yew, still in health and vigorous, which measures 27 feet in diameter, or upwards of 84 in girth. This venerable patriarch would therefore claim to be 3900 years old, or to have been about sixty years old at the time of the birth of Abraham.

In Scotland the fine yew at Dryburgh Abbey is supposed to have been planted when the abbey was founded in 1136; it is still vigorous, and has a trunk only 12 feet in circumference. Its calculated age would be scarcely 600 years; so that in this case, at least, De Candolle's calculation yields a less age than the true one. But according to Professor Henslow, the yew in England increases more rapidly than the Genevese botanist supposes. Thus there are two fine healthy trees of this kind at Basildon in Berkshire, in the churchyard, and which, according to the parish register, were planted in 1726. In 1834 they were nearly of the same dimensions, and the largest measured 9 feet 3 inches in circumference at 4 feet from the ground. This gives 424 lines for its diameter, or about 4 lines per annum as the mean rate of increase for a century. It appears, however, from some entries in the same register, that the tree had grown more rapidly during the former half of this period than it did latterly. "Taking these data as a guide," continues Henslow, "for estimating the ages of some old yew trees in the churchyards of two neighbouring parishes, it would seem that De Candolle's calculations should be reduced by about one-third in order to obtain a more correct approximation than that which he had given for trees of this description." It was found, for instance, that the layers of wood at different depths, in a hollow yew tree, at Cholsey in Berkshire, varied considerably in thickness, and that some of those which had been very recently deposited were 2½ lines, whilst others which were more than a century older were only half a line in thickness. This tree was between 14 and 15 feet in circumference; and there is another in the churchyard of the neighbouring parish of Aldworth, which is more than 19 feet in circumference, which, estimated by De Candolle's rule, ought to be above 900 years old, but by Henslow's, is only about 600 years. I cannot conclude this notice of the yew tree without alluding to that in Fortingal churchyard in Perthshire. The trunk of this was 52 feet in circumference when measured by the Hon. Daines Barrington in 1769, or 56 feet 6 inches according to Pennant, who measured it the following year, the difference being, in all probability, owing to the two measurements having been taken at different heights above the level of the ground. In Barrington's time the surface of the tree was nearly entire at the base, although upon one side all the interior had decayed. Afterwards the cavity reached the opposite surface, and the trunk at length separated into two distinct semicircular portions, dead and decaying within, but alive and growing at the circumference, between which funeral processions passed on their way to the grave. In this condition it is figured by Strutt in his *Sylva Scotica.* In summer 1833 one of these half trunks had disappeared, with the exception of some decayed portion that scarcely rose above the soil; but the other still shot forth branches from its summit, giving a diameter of more than 15 feet, so that the circumference of the bole, when entire, must have exceeded 50 feet, as stated by Barrington and Pennant. Considerable spoliation had been committed on the trees since 1769, large arms having been removed, and masses of the trunk itself carried off by the country people with the view of forming *quechs* or drinking-cups, and other relics, which visitors were in the habit of purchasing. To prevent further depredations, an iron rail was placed around it. I believe it is now dead. Had it still existed, it could scarcely have been less than 2600 or 2700 years old, dating its origin from about 800 years before the Christian era.

The Pine.

The fir or pine tribe attain to a great size, and are of rapid growth when young, although they afterwards increase but slowly. They are also of unexampled height; indeed, their mode of growth, their straight regularly tapering trunks, carried steadily upwards by the continual prolongation of the leading shoot, as well as the small lateral extension of their branches, is extremely favourable to loftiness of stature, and to full development in the midst of the forest. Loisleur mentions a larch in Le Vallais in Switzerland, which was 12 feet in diameter, or upwards of 37 in girth. Its age was about 576 years. The Scotch fir does not appear to attain to so large a size. I have, however, heard a friend (Sir W. Hooker) mention that he saw a plank at Gordon Castle of great length, and which measured 5 feet across in every part, and which the noble owner assured him had been cut from a tree 18 feet in circumference that grew in the forest of Glenmore, at the foot of the Cairngorm mountains. The annual layers were so thin and close that it was impossible to count them. It is mentioned in the statistical account of Scotland that there was then (in 1795) at Woodhouselee a silver fir (*Pinus picea*) which had been planted in 1701, and which in 1759, at 4 feet from the ground, measured 7 feet 4¾ in circumference, and in 1793, 11 feet 1 4-5th inch; it thus increased in girth about 1½ inch annually. But the finest of these firs in Britain are within 30 miles of Glasgow, in the woods of Roseneath, where there are two called the Carnsaile Trees. Their height is estimated at 80 feet, and their girth at 5 feet from the ground is 18 feet in the one and 19 in the other. Their age is between 150 and 160 years. They were the first trees of the species which were introduced into this country. It is a native of the Alps of Switzerland and Germany. The Norway spruce is probably the loftiest of the pine tribe in Europe, reaching in its native country from 150 to 200 feet in length. It has therefore been long celebrated as furnishing masts for the largest ships.

Milton, in his description of Satan, thus alludes to this excellence:—

> "His spear, to equal which the tallest pine
> Hewn on Norwegian hills, to be the mast
> Of some great amiral, were but a wand."

But it is the Norfolk Island pine (not, however, a true pine, but the *Araucaria excelsa*), which was lately so highly prized for masts in our navy, that the British Government sent vessels to bring home this timber from the distant shores of Australia. The tree springs with a perfectly straight stem 200 feet high, and has a diameter in proportion. I believe many now consider the wood too heavy for masts. In New England, North America, the white pine, on account of its pre-eminence in height over other trees, had long been selected as the emblem of the colonists; and at the time of the separation of the United States from their allegiance to this country, was stamped on their coins. Although it does not flourish well in Europe, it rises in its native soil to the height of 150 or even 200 feet, and was long considered as the tallest of North American timber trees:—

> "Not a Prince
> In all that proud old world beyond the deep,
> E'er wore his crown as loftily, as he
> Wears his green coronal of leaves."

Yet this white pine is overtopped by the Douglas pine or spruce (*Pinus Douglasii*), which forms the principal part of the gloomy forests of the Columbia River, or Oregon territory. The extraordinary height to which this species attains was first recorded by Lewis and Clarke, who state that the trunk is very commonly 27 and often 36 feet in circumference at 6 feet from the surface of the soil, and rises to the height of 230 feet, of which 120 are without a single limb. One measured by their party is said to have been 42 feet in girth at a height beyond the reach of an ordinary man, and was estimated to reach the height of 300 feet. Another is said to have "measured 318 feet in length, although its diameter was only 3 feet." Perhaps 3 yards are meant, although even that gives a small diameter for so great an elevation. Mr. Douglas, after whom the species is named,—for although noticed by Lewis and Clarke as a piece of timber, it was unknown to botanists till lately,—has since completely confirmed the accounts already given of it, and even mentions trees as high as 230 feet, with a circumference of 50 feet at the base. Another species in the southern districts of same part of the country, and North California, and first observed by the same Mr. Douglas, is equally extraordinary, perhaps more so because they do not form a thick forest, but are rather scattered at considerable distances over the plains. This is the *Pinus Lambertiana:* "At mid-day," says Douglas in his journal, "I reached my long-wished-for pines, and lost no time in examining them, and endeavouring to collect specimens and seeds. New and strange things seldom fail to make strong impressions, and are therefore frequently overrated; so that lest I should never see my friends in England to inform them verbally of this most beautiful and immensely grand tree, I shall here state the dimensions of the largest I could find among several that had been blown down by the wind. At 3 feet from the ground its circumference is 57 feet 9 inches; at 134 feet, 17 feet 5; the extreme length 245 feet. The trunks are uncommonly straight, and the bark remarkably smooth for such large timber, of a whitish or light-brown colour, and yielding a great quantity of bright amber gum. The tallest stems are generally unbranched for two-thirds of the height of the tree; the branches rather pendulous, with cones hanging from their points, like sugar-loaves in a grocer's shop. These cones, however, are only seen on the tallest trees." These cones can only be got by firing at them with ball, and therefore very few indeed have been sent in a perfect state to this country. The tree alluded to by Douglas was probably the largest mass of timber that ever was measured by man, and must have contained about 20,000 cubic feet of wood. Such a tree in this country would at the time have realized about £1000 sterling. The danger in which Mr. Douglas found himself from the Indians prevented him procuring sufficient data for ascertaining the age of such trees. A block from a small trunk, however, sent to England, gave fifty-six annual layers in about 4½ inches next the outside of the tree, so that if we suppose the large tree blown down and measured by him (but which he expressly tells us was inferior to many growing) to have grown only at that rate throughout, it must have been 1400 years old when overthrown.

But of all the pine tribe, the cedar is one of the most celebrated. It is the *Pinus cedrus.* Its resistance to absolute wear is not equal to that of the oak, but it is so bitter that no insect will touch the wood, so that it seems to be proof against time itself. The timber in the Temple of Apollo at Utica was found undecayed after a lapse of two thousand years, and a beam in the oratory of Diana at Seguntum in Spain was fetched from Zante two centuries before the Trojan war. Some of the most celebrated erections of antiquity were constructed of this tree. "Solomon raised a levy of 30,000 men out of all Israel, and he sent them to Lebanon, 10,000 a month, by courses, and he had *threescore and ten* thousand that bore burdens, and fourscore thousand hewers in the mountains. And he covered the temple with beams and boards of *cedar*; and he built chambers against it which rested on the house, with timber of *cedar*." The sacred historian also mentions that the same monarch had a palace of cedar in the forest of Lebanon. Ancient writers tell us that the ships of Sesostris the Egyptian conqueror, one of which was 280 cubits long, were formed of this timber, as was also the gigantic statue of Diana in the temple of Ephesus.

There is, however, some doubt about the ancient history of this tree, as other plants were also named cedars; thus the Deodar pine, which grows on the elevated range of the Himalayas, and much used throughout India, seems to have been the plant intended in several instances by even the sacred historians. The cedar mentioned by Horace appears to have been a cypress; and even in modern times several kinds of juniper from North America are termed cedars, one of which (*Juniferus Virginium*) yields the wood commonly employed for pencils. The true cedar, though not a lofty, is a very noble tree. Whether, however, those on Mount Lebanon were thinned to exhaustion by the axes of the king of Israel, or whether they have decayed in consequence of some variation of climate or other physical cause, it is difficult to say, but at the present day very few old ones exist. The celebrated grove near the summit of Mount Lebanon was first described in modern times by Belon, who visited it in the year 1550. The situation of the place may be marked by its vicinity to the village of Bsherreh, which stands about three miles to the west, on a spot a little less elevated. The village of Ehden and that of Kanobin are also in the neighbourhood, though more distant than Bsherreh, the one to the north of the cedars, the other to the north-west. The trees have been always venerated by the Maronite Christians, who firmly believed them to have been coeval with Solomon, if not planted with his own hands, and when Belon was there, they made an annual pilgrimage to the spot, at the festival of the transfiguration, the Patriarch, who resided at Kanobin, celebrating high mass under one of the oldest cedars, and very properly anathematizing all who should presume to injure them; this is generally known by the name of the *feast of the cedars*. Various accounts have been given as to the number of these cedars. In 1550, Peter Belon counted 28. In 1609, Litgow found twenty-four. In 1650, Le Gouz reports that only twenty-two were left. In 1696, Maundrell reduces them to sixteen; and in 1787, Labillardiere states that seven were all that had escaped the ravages of time; and since that time De Candolle states that all the elder trees have been destroyed. It is difficult to say what could have originated such an idea in De Candolle's mind, for it does not appear that any of those venerable treasures of antiquity are really missing. William Biddulph, who was on the spot near the end of the sixteenth century, says: "From Eden we rode ten miles farther up the mountain to see certain cedar trees, when we saw four-and-twenty cedar trees growing together as big as the greatest oaks, with divers rows of branches over one another, stretching straight out, as though they were kept by art. Although we read of great store of cedars which have grown in Mount Lybanus, yet now there are very few, for we saw none *but these four-and-twenty*, neither heard we of any more save in one place more." At that time, then, there were but twenty-four cedar trees in all—not twenty-four larger ones only, but twenty-four were all he saw, whether young or old. Now Burckhardt was there in 1808 or 1809, and according to his statement published in 1810, there were eleven or twelve of the oldest and best-looking trees, twenty-five very large ones, about fifty of middling size, and more than 300 smaller or younger ones. "The oldest trees (says he) are distinguished by foliage and small branches at the top only, and by four, five, or even seven trunks springing from one base; the branches and foliage of the others lower, but I saw none whose leaves touched the ground like those in Kew Gardens. The trunks of the old trees are covered with the names of travellers and other persons who have visited them. I saw a date of the seventeenth century. The trunks of the oldest trees seem to be quite dead; the wood is of a grey tint." Dr. Richardson also, a modern traveller, has supplied us with information respecting these trees, and as his description is best calculated to give a general description of the whole scene, I shall make no apology for laying it before you: "The descent from the higher summit of Lebanon is rather precipitous, and winds by a long circuitous direction down the side of the mountain. In a few minutes we came in sight of the far-famed cedars that lay before us on our right. At first they appeared like a dark spot on the base of the mountain, and afterwards like a clump of dwarfish shrubs that possessed neither dignity nor beauty, nor anything to entitle them to a visit but the name. In about an hour and a half we reached them. They are large, and tall, and beautiful, the most picturesque productions of the vegetable creation that we had ever seen. There are in this clump two generations of trees; the oldest are large and massy, rearing their heads to an enormous height, and spreading their branches afar. We measured one of them, which we afterwards saw was not the largest in the clump, and found it 32 feet in circumference. Seven of these trees have a peculiarly ancient appearance; the rest are younger, but equally tall, though for want of space their branches are not so spreading, yet the spectator views them with an elevation and warmth of heart, and feels as if he were introduced to the venerable descendants of an illustrious family, who, tired with the persecution and assaults of fortune, had taken up their abode in this sequestered and sunny spot, which they hallow by their presence, where they grow uncontaminated, and look with a lordly pre-eminence over the ground, which in better days their ancestors called their own. The clump is so small that a person may walk round it in half an hour. The old cedars are not found in any other part of Lebanon. Young trees are occasionally met with; they are very productive, and cast many seeds annually." It would thus appear that older travellers counted every tree they saw, both young and old, without distinguishing them, while those of the present day take notice of from seven to twelve as enormously large, while others are smaller. There is therefore no discrepancy between the different accounts, nor anything to lead us to suppose that their number is diminishing; while, on the contrary, by including all the younger ones seen by Burckhardt, they have very considerably increased. According to Binot, some of them rose to the height of 60, 80, or even 100 feet. Gabriel Sionita says that five men together could scarcely fathom the trunk of one; and Maundrell, about one hundred and fifty years ago, found one of the largest, then quite sound, to measure 36 feet 6 inches in girth, or 11½ feet in diameter. The largest seen by Labillardiere in 1787 was little more than 9 feet in diameter. M. Laure, an officer in the French navy, who visited Mount Lebanon in 1836, and who, I may here state, affirms that fifteen out of the sixteen old cedars mentioned by Maundrell are still alive, although decaying,—M. Laure mentions that one of the healthiest, but perhaps the smallest trunks, measured 33 French feet, or about 36 English feet in circumference, not very different from the dimensions of the largest given by Maundrell. Now the girth of these large trees being known, and the average rate of growth of younger plants being ascertained, a highly probable estimate of their age may be formed. In this country the tree thrives well, and probably there are many more now in England than, including the young ones, on all Mount Lebanon. Of those planted in the Royal Gardens at Chelsea in 1683, two had in eighty-three years acquired a circumference of more than 12 feet at 2 feet from the ground, while their branches extended over a circular space of 40 feet in diameter. Twenty-seven years afterwards the trunk of the largest one had increased more than half a foot in girth. One planted by Dr. Uvedale in the garden at Enfield, about the middle of the seventeenth century, had a girth of 14 feet in 1789; 8 feet of its top had been blown down by the great hurricane in 1703, but still it was 40 feet in height. At Hendon Place in Middlesex, a remarkable cedar was blown down in 1799. It had attained the height of 70 feet. The branches covered an area of 100 feet in diameter; the trunk was 16 feet in circumference at 7 feet from the ground, and 21 feet at the insertion of the great branches 12 feet above the surface. It is supposed to have been planted by Queen Elizabeth; this was therefore about 230 years old. From such an imperfect data, De Candolle deems some of the trees measured by Rauwolf in 1574 to have been at least 600 years old, which would give the age of nearly 900 years to any of them that may be still alive. This estimate may fall considerably below the truth, but our present knowledge will not warrant the assumption of a higher one. Doubtless this remarkable forest has existed from primæval times, while the oldest individuals, from age to age, have decayed and disappeared. While these remarkable remains of antiquity exist, whether we consider their great age (probably the immediate successors to the very cedars which Hiram nearly 3000 years ago caused to be cut down for the erection of the temple on Mount Zion), if we regard their majestic height, the vast extent of their shade, their perpetual verdure, the enormous girth, the varied form of their branches which change with their age, the delightful shadow afforded by their foliage, the delicious scent of the fruit, the undecaying nature of the wood, in whatever respect we advert to the cedars of Lebanon, the remembrance of former times all conspire to render them emblems of immortality, objects of curiosity, and subjects of admiration.

(To be continued.)

ASPECTS OF OREGON.

BY A LUMBERMAN'S WIFE.

THE north-west coast of America, like the western shores of Scotland and Norway in the Old World, is penetrated by innumerable lochs and fiords, which are on the same gigantic scale as the lakes and rivers of this new continent. One of the most majestic of these arms of the sea is the Puget Sound, which opens from the Straits of San Juan de Fuca, and winds southwards through Washington Territory for nearly a hundred miles, and which has minor arms, bays, and inlets of its own, branching off and running up into the land in all directions. This immense volume of water rolls majestically between sombre, thickly-wooded banks, where, for miles and miles, there is not the slightest sign of human life. Here and there the snow-covered summits of the Cascade Mountains rear their heads above the dark forest slopes. Promontory succeeds promontory, and there is no break or clearing in the masses of firs and pines, except, perhaps, where a sawmill has been erected near to the water's edge. From Port Townsend at the entrance, to Tacoma at the head of the Sound, the solitude is broken only by the busy little town of Seeattle. The contrast is great between the steep streets stretching away up to the hill-top, the modern buildings, and handsome residences that cover the ascending slopes and crown the heights above, and the great "forest primeval" that surrounds and encloses the town on all sides. That the town site has only recently been wrested from the forest, is evident from the stumps of trees that have been left standing on every vacant lot. Seeattle has a line of railway connecting it with coal mines in the neighbouring mountains, and the mail steamers running between Victoria and Tacoma at the head of the Sound give the means of communication with the world beyond.

The eastern mails to and from British Columbia are at present carried over the Northern Pacific Railway by Portland, Tacoma, and Puget Sound, and there is consequently almost daily communication between Victoria and Portland. The journey from the one place to the other occupies a day and a half, and is performed in the leisurely manner dear to all Victorians. We do nothing in a hurry.

Port Townsend is about thirty years old. It is a busy little place, with a population of 1500. The business part of the town has been built round the bay, but the dwelling-houses have spread themselves over the slope of the hill behind, which rises to a height of 80 or 100 feet. At all ports along these North American coasts it is the lumber trade which makes itself most visible. The sawmill at Port Townsend is a large one, and can cut 40,000 feet of lumber a day. At the head of the bay are some considerable ironworks, owned and worked by San Francisco capitalists.

The entrance to Puget Sound is defended by a fort built on the hillside, a mile or so beyond Port Townsend; but the little square clearing in the midst of the dark woods had so peaceful an aspect, that it suggested love in a cottage and all idyllic joys rather than the horrors of war.

Behind the town the long unbroken range of the Olympian Mountains stretches away westward to the Pacific Ocean, and forms the southern shores of the Straits of San Juan de Fuca. But the grandest mountain scenery is to the east, on the other side of the Sound, and of this there are magnificent views to be had from Port Townsend. Mount Baker, the most northern peak of the Cascade range, rising to a height of from ten to eleven thousand feet, and crowned with eternal snow, is visible in all its stately majesty; and, farther south, other peaks of the Cascades rise above the dark and thickly-wooded shores of Puget Sound. But soon after we left Port Townsend, the more distant mountains were hidden by clouds, and presently a light rain began to fall. Showers and sunshine succeeded one another all day; and all day we followed the winding course of the great channel whose waters roll inland amid impenetrable forests.

During the morning we called at Port Ludlow, one of the largest sawmills in the world; and afterwards at one or two smaller sawmills along the coast. Many of the inlets of the Sound reminded us of bays on the west coast of Scotland; but instead of a little fishing village, picturesque in its irregularity, with a glimpse of a church and a decent manse in a sheltered position inland, and rough stone cottages with overhanging thatch on the beach, in the midst of boats drawn up out of reach of the tide, and fishing nets spread out to dry, there is the inevitable sawmill, with its sheds and lumber yard; the little store, where everything is sold, from brass rings and coloured beads to whisky and pipes and tobacco; and half-a-dozen frame houses, all alike, new and unpainted. White labour is scarce in the country, and so there are no groups of idlers to be seen watching for the arrival of the boat, no bonnie lassies with kilted skirts and bare feet, and no brown-faced children clinging to their mothers, or paddling about in the water.

There are very few birds on these northern shores; but a flock of sea-gulls followed us all day long, as years before they had followed us up the Elbe, and as they followed us after we had said good-bye to England, and had crossed the bar of the Mersey.

NOTES ON BRITISH ORCHIDS.

BY A. D. WEBSTER.

No. III.

O. hircina (lizard Orchid).—Tubers globose and somewhat downy. Stem from 18 inches to 2 feet in height, hollow, and with a few rather large lanceolate or elliptical leaves. Flowers of a dirty greenish white, purplish within, and strongly though not pleasantly scented. Lip divided into three segments, the middle one brownish purple, long, linear, and twisted.

THIS rare and singular plant cannot be confounded with any other, the long linear lip having a fancied resemblance to a lizard, and from which the popular name of lizard Orchis is derived. It was formerly found in Kent and Surrey, growing on chalky wastes and meadows, but if not now extinct in a wild state, is certainly very rarely seen. Some few years ago this orchid was reported to have been found on the Great Orme's Head by a plant-dealer, who at that time resided in Llandudno; but the statement, which occasioned a good deal of comment and not a little displeasure, is generally disbelieved by local and other botanists who have paid no small amount of attention to the interesting and rather rare flora of that beautiful headland. Admit we must that the plant-dealer in question had several specimens of this orchid in his possession at the time, which, coupled with the fact that the limestone formation of the Orme's Head would be suitable for the growth of the plant, renders the statement not impossible, although certainly very improbable. This plant is difficult to cultivate, and usually dies out after flowering. It may, however, be grown for a year or two by mixing a quantity of fine loam and lime rubbish together, and planting the tuber rather deep, so as to prevent as much as possible the leaves appearing above ground during winter—a fault to which I have found it particularly susceptible.

As a garden plant, it is certainly more interesting as a botanical specimen, than for any beauty of either foliage or flowers.

O. laxiflora (the loose Orchis).—Tubers globose. Stem from 12 to 18 inches in height, grooved, with long, narrow, acuminate, bright green leaves. Flowers resembling those of *O. mascula*, but much larger, of a rich reddish purple, and placed very loosely or distant on the stem. Sepals and petals obtuse. Lip spotted, as broad as long, margins recurved, and with the lateral lobes large and crenulate.

Hitherto this orchid has, in Britain, only been found in Guernsey and Jersey, and there, no doubt, introduced by some means from the mainland of France, where, as well as throughout Southern Europe generally, it is pretty abundant. It is an occupant of moist meadowland, and usually found growing in rather warm maritime districts. When hastily examined, this orchid has a great resemblance to the green-leaved form of *O. mascula,* but on closer scrutiny very marked differences are observable. The plant when well grown is taller than *O. mascula* generally, more slender, and with narrower leaves. The flowers are also of a richer colour, indeed in some specimens they are almost of a deep red, and placed distant and somewhat irregularly on the stem. From May to June may be considered the flowering period of *O. laxiflora,* much depending on the situation in which it grows. On the ballast heaps near Hartlepool, where, as well as on the above islands, it has recently been found in some quantity, the flowers are produced later than where grown in the damp, sheltered meadows nearer sea-level.

O. intacta (dense-spiked Orchis).—Tubers ovoid, entire. Stem seldom exceeding 6 inches in height, but more commonly three-fourths that size, with a dense spike of small pink or purplish flowers. Leaves broadly oblong, largest at the base, decreasing in size upwards, where they become narrower and more acuminate. Bracts one-nerved, shorter than the ovary. Lip three-lobed, lateral lobes short and linear, middle one either entire or notched.

This little plant, which has given a more than ordinary amount of trouble in classification, having been referred to no less than six genera, has recently been found in the county of Galway, Ireland. As will be seen from the above description, it is a small-growing species, the general habit and stature very nearly resembling the small white Habenaria (*H. albida*). Although rare in this country, having, so far as is known, but one station, it is on the Continent commonly distributed, occurring in quantities in various parts of France, Northern Italy, and along the Mediterranean coast generally. It also extends into North Africa and Asia Minor.

Limestone pastures seem the favourite haunts of this rather inconspicuous orchid, although in various stations it is frequently found growing in soil entirely destitute of lime—a peculiarity that is shared in by various other species of orchis. The flowers, which are produced in June in a dense spike, are more or less turned to one side, and the leaves are often, though not always, spotted.

By different botanists this species has been successively referred to several of the sub-genera of *Orchis,* and by others raised to a distinct genus under the name of *Tinea,* which has, however, been again changed to *Neotinea* by Reichenbach.

Genus 2.—*Habenaria.*—Foliage and flowers similar to those of an *Orchis,* but the two anther cells instead of, as in *Orchis,* converging at the base, are separated from each other by a wide space of connective membrane.

Three species are included in the genus *Habenaria, H. bifolia, H. albida,* and *H. viridis.*

H. bifolia (Butterfly Habenaria).—Tubers entire, carrot-shaped, and tapering to a fibrous point. Stem angular or ribbed, from 12 to 15 inches in length, and with two, rarely three, broadly ovate or elliptical leaves at the base. Flowers in a rather loose oblong spike, white or yellowish white, except a greenish tinge on the lip and spur. Lip spear-shaped, cylindrical, and entire. Spur twice as long as the ovary.

This, the most ornamental plant of the genus, is widely distributed over Britain, occurring in open woods, meadows, and downs from sea-level up to great elevations. It is found in a great variety of soils—peat, loam, clay, and sandy—but prefers and attains to greatest perfection in rather moist, rich brown clayey loam. Than this simple tenant of our woods and downs, few plants are more delicately beautiful and interesting. The flowers, which, more especially in the evening after a shower of rain, are deliciously fragrant, are produced on stout stems of over a foot in length. Usually the flowers are rather lax, but this is not constant, as specimens with very compact heads are by no means uncommon. Little or no variation either in the colour or structure of the flowers of this species exists, although the name of *H. chlorantha* has, especially by some of the older botanists, been bestowed on large-flowered specimens of *H. bifolia*, and which have the anther cells more broadly diverging at the base. That certain classes of soil alter the general appearance of this orchid is readily admitted, but in none of these specimens are the differences either sufficiently distinct or constant to warrant the plants being raised to a separate species. This remark, although it may meet with a rebuff, is simply the writer's belief after years of careful attention to the plant in a district where ample opportunities have been afforded for its study under various circumstances as regards quality of soil, altitude, and situation.

When found growing in strong, heavy, rather damp loam, the plant is always most luxuriant, the leaves and flowers being much larger, and the latter of better substance and colour than when grown in poor, half-starved soils. Let any one who wishes to try the experiment carefully transplant a specimen of the extreme type, or what has been named *H. chlorantha*, into poor, rather dry soil, and in a wonderfully short space of time he will arrive at the above conclusions, and that the extreme type is simply the result of soil in every way suitable for the healthy development of the plant. The position of the viscid discs goes for little, as in this district intermediates passing gradually from the broad to the narrower forms are not uncommon.

Darwin, in his *Fertilization of Orchids*, writes as follows regarding *Habenaria bifolia*, or the Lesser Butterfly orchis:—"I am aware that this form and the last (*H. chlorantha*) are considered by Mr.

Bentham, and by some other botanists, as mere varieties of one another; for it is said that intermediate gradations in the position of the viscid discs occur. But we shall immediately see that the two forms differ in a large number of other characters, not to mention general aspect, and the stations inhabited, with which we are not here concerned. . . . The viscid discs of the Lesser Butterfly orchis are oval, and face each other. They stand far closer together than in the last species; so much so, that in the bud, when their surfaces are cellular, they almost touch. . . . The caudicles of the Lesser Butterfly orchis are relatively very much shorter than in the other species; the little pockets of pollen are shorter, whiter, and, in a mature flower, separate much more readily from one another. Lastly, the stigmatic surface is differently shaped, being more plainly tripartite, with two lateral prominences, situated beneath the viscid discs. These prominences contract the mouth of the nectary, making it sub-quadrangular. Hence I cannot doubt that the larger and lesser Butterfly orchids are distinct species, marked by close external similarity." That these statements are beyond dispute in some specimens of *Habenaria bifolia* I have often proved, but, at the same time, in this district, where the orchid is found under such variable circumstances, as I have before said, intermediate gradations in the position of the viscid discs are by no means uncommon.

In this orchid, as well as several others on which I have experimented, strong growth may be induced by not allowing the seeds to ripen on the plant; indeed, I have frequently noted that in places where this orchid is cut over when the flowers are on the decline, the specimens are in a marked degree stronger than where left undisturbed. In a little mountain meadow at a considerable elevation above sea-level, I was fortunate enough last season to meet in with a remarkably distinct form of this orchid, having beautifully variegated leaves. There were some half-a-dozen specimens, some in flower, and others, younger, without, distributed over the field and at some distance apart, which induces me to believe that the variegation is constant, and may be reproduced in seedlings. I transferred the largest plant to my garden, where it flowered well, and offered quite a rich contrast to the ordinary form. The others were left untouched for further observation and experiment.

Although in *H. bifolia* will be found a most ornamental garden plant, still to cultivate it successfully has puzzled not a few. When transferred to the garden, it should be lifted with a good deep ball of earth, as the long, carrot-shaped tuber strikes downward for several inches, and if in the least injured permanent evils are the result. I have also noticed that the fresh loam that has been introduced with the plant entices numbers of wire-worm, which soon destroy the vitality of the tuber by boring or eating into it beneath the bud.

Under these circumstances, and more especially if the garden soil is not equally good with that introduced, I have found it advisable to carefully divest the root of all soil, and plant in the place intended with a good dash of sand thrown under and around the tuber.

H. albida (small Habenaria).—Root composed of several clustered tapering fibres, occasionally uniting into a deeply-divided tuber. Stem about half a foot in height, with a dense, cylindrical spike of many small, creamy-white flowers. Leaves lanceolate, light green, glaucous beneath, the lower ones broadest, and rounded at the point. Lip three-lobed, the middle one being largest, and of the same length as the concave sepals.

A sweet little plant, but one that has baffled my best attempts to successfully cultivate. It is usually found growing amongst short grass, on the drier knolls of the mountain, meadow, or pasture land, and most luxuriant in what may be described as a fine, peaty loam. Well-grown specimens of this orchid rarely exceed 7 inches in height, the flower spike alone being 2 inches, remarkably dense, and somewhat cylindrical.

The flowers are sweetly scented, very numerous, and thickly placed on the stem. In this county (Carnarvonshire), at an elevation of 500 feet above sea-level, I have found this orchid in some plenty growing along the raised banks of streams and rivulets. It is a real mountain plant, being found abundantly in the Highlands of Scotland, and extending little beyond the northern parts of England. It is also found in Ireland.

H. viridis (green Habenaria).—Tubers palmate. Leaves deep green, ovate or elliptical. Flowers greenish-yellow, arranged in a rather close spike, and about double the size of *H. albida*. Lip linear-oblong, about twice the length of the sepals, and terminating in two long lobes, with a smaller one between.

From its dull green, inconspicuous appearance, and small size, this orchid is by no means easily detected, even when growing in quantity, and for this reason may be more plentiful than is generally supposed. The whole plant seldom exceeds 8 inches in height, with greenish-brown flowers, is more stiff and sturdy than *H. albida*, and with larger and broader leaves. Dry, hilly meadows and pasture lands are its favourite haunts, and the soil in which it delights to grow a rather loose free loam. It is local in its distribution, and frequently only occurs in single specimens; but this supposed scarcity is, I believe, as before stated, owing to the general resemblance of the plant in colour to the grass amongst which it is usually found. In the adjoining island of Anglesey it is pretty abundant, and has also been found, though sparingly, on the hills above Bangor. The geographical distribution of the plant in Britain is somewhat similar to the latter species,—frequent in Scotland and northern England, but much less so farther south. Neither this plant nor *H. albida* are very amenable to cultivation, which is, I believe, due in a greater measure to our inability to produce the bracing mountain air in which they seem to delight than from any difficulty in procuring either a suitable soil or situation.

It flowers from June to August.

Genus 3.—*Herminium.*—The want of a spur at once distinguishes this from *Orchis.* Anther cells wide apart, especially so at the base. Flower small and inconspicuous, emitting a strong honey-like odour.

There is but one species, *H. monorchis.*

H. monorchis (musk Herminium).—Stem 4 or 5 inches in length, with two, rarely three, lanceolate radical leaves placed near the base. Spike dense, composed of small, yellowish-green flowers, which, especially in the evening, have a faint perfume of musk. Lip upturned, of the same size and colour as the petals, but deeply lobed at each side, and hollowed at the base.

Tuber about the size of a good large pea, nearly globular, and produced at the extremity of one of the fibres proceeding from the crown.

In Britain this plant is rather sparsely distributed, occurring in but a few English counties (chiefly the southern and eastern), and has not, that I have heard of, been recorded from either Scotland or Ireland.

It is usually met with in barren, calcareous pastures, and about old chalk pits. When transferring this plant to the garden, great care is necessary to avoid injuring the young tuber, which, unlike the generality of our native orchids, being found at some distance from the original plant, is not easily detected. I have grown it very successfully alongside a block of stone and in soil composed of chalk and loam; the increase has also been rapid, usually three new plants appearing each year. Great differences in the general appearance of this orchid, but more particularly the flower, are observable, and this I have particularly noted, even in plants the produce of one parent. In some specimens the flowers are arranged in a close, compact spike, while in others they are lax in the extreme.

It flowers in July.

METEOROLOGY.

THE INFLUENCE OF FORESTS ON CLIMATE.

THE third number of Petermann's *Mittheilungen* for this year contains an article by Herr A. Woeikof on the influence of forests on climate. The commencement of a scientific investigation of this subject was made when the Bavarian forest meteorological stations were established, and when Prussia, Alsace-Lorraine, France, Switzerland, and Italy followed the example. As a general rule, it may be laid down that in the warm seasons, as between forests and places close at hand which are treeless, (1) the temperatures of the earth and air are lower in the former, (2) their variations are less, (3) the relative humidity is greater. After examining observations as to evaporations, Herr Woeikof states that the influence of forests in diminishing evaporation from water and the soil is so great that it cannot be accounted for alone by the lower temperature of the hot months, the greater humidity, or even by the shade. An important influence, which has hitherto been but little appreciated, is the protection from the wind afforded by the trees, and this the writer regards as more important than all the others together in reducing the degree of evaporation. With regard to the influence of forests on rain and snowfall, there is as yet only a single series of observations supplying comparative statistics, and extending over a sufficiently long period. These were taken in the neighbourhood of Nancy, and they show an important influence of forests in increasing the rainfall. It might appear that the effect of forests on rain in the climate of Central Europe in winter would be small, for the difference between the temperature and humidity of the forest and the open is very little, and the quantity of moisture in the atmosphere is small. But the observations show that it is at this time of the year that forests get much more rain. This the writer attributes to the clouds being lower, the resistance which the forest offers to the movement of the air, and to the moist west wind. Forests retain rain by the undergrowths of grass, moss, etc., much better than open ground, and let water off superficially only after a heavy rainfall; the remainder filters upwards slowly, and much of it is used for the evaporation by the trees. Although forests, especially thick, luxuriant forests, cannot exist without certain supplies of moisture, yet it is the same to them when the supplies come, for they retain what they get and use it over a long period. One example of this is the Lenkoran forest on the west coast of the Caspian, where the vegetation is more luxuriant than in any other part of Europe, yet very little rain falls in summer, but the rainfall in autumn and winter is great. The water is stored up by the forest, and is used in evaporation during the heat of summer. Humidity of the atmosphere, however, is not inconsistent with a high temperature, as the Red Sea shows; but in forests the humidity is due to the evaporation of the leaves—in other words, to a process by which heat is converted into work, and hence the coolness. Herr Woeikof then endeavours to ascertain the influence of forests on the climatic conditions of their neighbourhoods in the western parts of the Old World, between the 38th and 52nd degrees N. latitude, the places selected being in all cases in the open. Thus for the 52nd degree eight stations are taken between Valentia in Ireland on the west and the Kirghiz steppes on the east; for the 50th, Guernsey on the west, Semipalatinsk on the east, and thirteen stations, and so on for each two degrees of latitude to 38°. The general result of the observations in fifty stations in six different degrees of latitude is that in Western Europe and Asia large forests have a great influence on the temperature of places near them, and that by their influence the normal increase of temperature as we travel eastward from the Atlantic Ocean to the interior of the continent is not merely interrupted, but they give places far removed from the coast a cooler summer than those actually on the sea. A striking example of this is Bosnia. An examination of the statistics shows (1) that in Bosnia the summer is 2°·5 to 4°·5 cooler than in Herzegovina; (2) even on the island of Lissa, in the full influence of the Adriatic Sea, the summer temperature is more than a degree higher than that of Bosnia, which is separated by lofty mountain ranges from the sea. Bosnia owes this comparatively cool summer to its great forests, while Herzegovina is almost disafforested. To sum up: forests exercise an influence on climate which does not cease on their borders, but extends over a larger or smaller adjacent region according to the size, kind, and position of forest. Hence man by afforestation and disafforestation can modify the climate around him; but it is an extreme position to hold that by afforestation the waste places of the earth can be made fertile. There are places incapable of being afforested, which would not give the necessary nourishment to trees.—*Nature.*

THE ENTOMOLOGIST.

THE PINE WEEVIL.

HYLOBIUS ABIETES.

At the beginning of the month, Mr. Robertson, forester at Novar, Ross-shire, forwarded us in a glass bottle two living specimens of an insect reported to be effecting great ravages in the woods under his charge. We forwarded the parcel to Miss Ormerod, at the same time expressing an opinion as to the specific name of the prisoners. That lady promptly replied as follows:—

"You are quite right as to the beetles forwarded by Mr. Robertson being the Pine Weevil. They are the *Hylobius abietes*, Linn., scientifically, and are distinguishable by the interstices between the striæ on the wing-cases being *very* rough, the patches on them of yellowish down, and the legs black, from the variety sometimes considered to be a distinct species, the *Hy. pinastri*, Gyll.

"This has the interstices less roughened, the markings on the wing-cases of whitish pile, and the legs red."

Mr. Robertson, as requested, has furnished us with the following details as to the ravages effected:—

"The Pine Weevil has been doing considerable damage in a young plantation of about 150 acres, composed of fir and larch. Part of the ground was cleared some fifteen years ago of a heavy crop of Scots fir, and on this portion little or no damage has been done; the remainder of the ground was cleared of a heavy crop of Scots fir two years ago, the trees of which were about 105 years old, and would average about 38 cubic feet of timber each. The brushwood was all burned before planting, and last season I noticed some damage had been done by insects, but I failed to get any of them; and as a good deal of damage had been done by rabbits and hares, the plantation was beat up this last spring. In the beginning of May, I found, on a scrutiny of this plantation, that the Weevil attacked both the Scots fir and larch, eating the bark off in patches. I employed boys to gather the insects, and bring them to me in boxes, paying them 6d. per dozen for them, and in this way I have killed some 900 of the pests. There are some trees of *Pinus laricio* planted in the same wood, but I have not found any damage done to them as yet.

"The insects are most numerous in the neighbourhood of the sawmill where the old timber was cut up; and also at a part where the timber was allowed to remain a considerable time on the ground after the roots were cut off, before being carted to the mill.

"I also find that the bark of old roots are perforated with small holes, and I am under the impression that these holes were made when there was some of the natural sap in the root. Do the insects breed in half-dry wood or in perfectly dry wood, or in the soil?

"The men who are employed at the sawmills here inform me that they often see the same insect about the mills; very often when a parcel of wood has been cut and thrown loosely together. If allowed to remain for two or three days before being stacked, they find this insect between the boards or sleepers, eating the bark from any wanney edge, and sucking the sap from the sawn wood. The men know them by the name of hardics. Indeed, the foreman of the mill informs me that he has seen them in hundreds, where he was working some years ago in Strathspey, amongst the natural timber there.

"There has been an enormous amount of damage done both on this property and the adjoining estate of Ardross, by squirrels, but this is the first appearance of the Weevil. As little or no planting has been done in the locality for a number of years, he may be at work on the old timber without being noticed.

"Wherever we have planted on ground where no wood has been before, there is no appearance of the Weevil."

Mr. Robertson has well noted the time when these beetles appear, though in June and July they are usually most evident. Here, too, as observed previously, ground from which a crop of old fir had been previously removed, is the site of their ravages. The perforation of the bark of the old roots by holes is caused by the working of the maggots which may be found from June onwards throughout the winter. The pupæ, on the other hand, are found in spring in their cocoon-like nests. Some beetles hybernate in moss, fallen leafage, holes in the earth, or roots under the trees, reappearing at the same time. Mr. Wilkie saw considerable numbers of these beetles apparently dead, but which recovered when held in the hand, within half an inch of the outside of an old pine tree in February, near Inveraray, when severe frosts had prevailed for several weeks previously.

Miss Ormerod's *Annual Reports*, as well as her *Manual*, contains a summary of practical experiences of some of the best practical foresters in dealing with this pest. [These works are, by the way, by no means confined to the elucidation of insects injurious to farm and garden crops, Part ii. of the *Manual*, from page 173 to 244, being devoted to "Forest Trees and the Insects that injure them," and we are ready to publish any additional experiences or experiments of foresters regarding the insects so described.] Hand-picking was not found so successful in one case, as the beetles dropped from the trees on disturbance. The hand-picked insects should be destroyed in boiling water. The anointing of old stumps with well-known insecticides, such as Scheele's green, has been followed by good results. Then Mr. M'Corquodale has tried the following plan with success. We quote Miss Ormerod's *Annual Report* for 1879:—

"After the Pine crop is cut and cleared, the ground is enclosed thoroughly, so as to exclude stock of all kinds, and if required is drained. The ground is permitted to rest the first summer for the purpose of getting up all herbage as strongly as possible, and in dry spring weather the whole is burned, so as to destroy the eggs and food of the Beetle, and, as far as may be, stamp it out. After this the ground should be planted with strong two-years' transplanted plants. After each young tree is planted, a layer of earth is laid round it, about two inches in thickness and eighteen inches in diameter; this layer should be beat smooth with the back of the spade to prevent the Beetle lodging under any part of the rough surface. This treatment was found to answer very well, for as soon as the Beetle in search of food comes in contact with the bare earth it immediately steers its course in another direction, and leaves the plant untouched. The Beetle is found to be most destructive in dry warm seasons."

Mr. Robertson is afraid to burn the brushwood, because of the danger of igniting the valuable old wood; and is thereby precluded from using what has been found to be perhaps the most effective agency for the destruction of this insect pest. Perhaps M. Gaillot's automatic torch, figured and described in this number, might be usefully employed in such instances as we have been considering.

THE OX WARBLE FLY.—Miss Ormerod asks us to direct attention to the extirpation of this pest; and specially to ask recruits to the cordon of farmers, tanners, and others formed for the purpose. In No. 3 of the tracts entitled "Notes on Injurious Insects," devoted to this topic, which, by the way, has reached its fifteenth thousand, we have the annual national loss estimated at from two million to seven million pounds sterling per annum at the least. It is clearly shown that this may at once cease.

LETTERS TO THE EDITOR.

FORESTRY AT NOVAR, ROSS-SHIRE.

SIR,—Our soil, which is a good yellowish loam resting on rocks of the Old Red Sandstone system, is unsuitable for the growth of such hardwood trees as oak, elm, sycamore, etc., although birch and beech in considerable quantity are flourishing on the better portions of the soil. Larch planted on lands cleared years ago flourishes, as does also the same tree planted on recently cleared ground.

On our younger plantation there is no appearance of aphis or blister, and this gave us more encouragement to plant a sprinkling of larch on the ground recently cleared.

In some of our plantations about seventy years old, the larch is afflicted with what is known in this locality as *roy*. In my opinion, this has been caused by want of being judiciously thinned when about twenty to thirty years old. I generally find that the *roy* is in the wood formed between the twentieth and thirty-fifth ring, the heart and the outside being perfectly sound; and wherever a tree with a fairish top is found, it is invariably sound; and far less *roy* is found on the slopes than on level ground. I account for this because more of the foliage is exposed to the action of the atmosphere on the slopes than on the level ground. Where *roy* most abounds, the trees are drawn up into long poles, very clean and nice to look at, with a very limited top of leaves.—I am, Sir, yours faithfully,

D. ROBERTSON.

NOVAR, EVANTON, 15*th June* 1885.

PRUNING QUERIES.

SIR,—On reading in your issue for June, Mr. Sutherland's paper "On Pruning," some questions suggested themselves to me. Is the timber of the best pruned trees, according to Mr. Sutherland's views, superior to that of trees grown without the aid of man? Is the growing of timber trees an art that has something other than Nature to imitate? If so, what is that something? Advocates of pruning have made frequent reference to surgery—must surgery, therefore, be studied by the forester before he can fully understand this great pruning mystery? Mr. Sutherland prefers to regard sculpture as the forester's pattern art—must foresters, therefore, study sculpture? I am aware that these may be figures of speech; but if Mr. Sutherland may exalt such a form of expression as "Nature pruning" into a "school," may we not confer a similar dignity on his forms of expressions? The writer mentions three different "schools" of pruners, from all of which he himself differs—is he at the head of a fourth "school"? If so, the progress of forestry in this country will be inversely as the "attendances."

THOMAS WILSON.

EDINBURGH, 12*th June* 1885.

[Our correspondent is perhaps a shade too hypercritical. Working foresters, we have noticed lately, appear to have a strange aversion to the term school, let it be used in any of its meanings. Perhaps early recollections of the rigid discipline that used to characterize the Scottish parish schools may partly account for this. We admit the letter in evidence of our desire to ventilate every side of a question when this is done in a temperate manner. We by no means homologate every opinion of our contributors. By all means let us have a discussion on pruning in which correspondents will grapple with the question. Perhaps Mr. Wilson will detail the evil effects of "Nature pruning"?—ED.]

ARBORICULTURE ROUND WEST CALDER.

SIR,—Having recently had occasion to make a gig journey on the Edinburgh and Lanark road which skirts the barren uplands westward of this village, well known now even in England through political associations, I made notes. An arborist's journey in the high western moorlands of the valley through which the line of the Caledonian Railway runs betwixt Edinburgh and Glasgow reminds the passing traveller of Dr. Johnson's celebrated Scottish journey in search of a tree. Beyond Woodmuir Colliery, a belt of firs is so diminutive as to suggest Japanese pruning, did not sulphurous vapours from the adjoining coke ovens, as well as from the high stalks of Addiewell down in the valley, indicate the cause. On descending the steep sloping road leading from the Forth downwards to Carstairs, and girded to the east by a narrow belt of plantation, we observed in it a multitude of trees either split through the centre or prostrated from their roots upwards, apparently the results of periodic gales. Why are shelter belts planted in so narrow strips? Might not the appropriation of larger areas for protection form a suitable subject for discussion in your columns?—I am, etc.,

T. W. R.

REVIEWS OF BOOKS.

Russian Central Asia, including Kuldja, Bokhara, Khiva, and Merv. By HENRY LANDSDELL, D.D. In two volumes. London: Sampson Low, Marston, Searle, & Rivington. 1885.

IN 1882, after a day's deliberation, and with a celerity only paralleled by that of the great Indian general, Dr. Landsdell determined on his mission of Bible distribution in eight provinces, with a total population of 4,908,000, including upwards of twenty towns with populations varying from 1000 to 80,000, in only one of which, or perhaps two, the British and Foreign Bible Society had been able to send a consignment of Scriptures. One of the other English travellers, attempting to penetrate to Russian Central Asia, a clergyman, too, who proceeded as far as Tashkend, had been ordered to be off within four-and-twenty hours; whilst the last two Englishmen who entered Bokhara were put to death, and Dr. Wolff, who went to ascertain their fate, nearly lost his life. Yet our author made his will, committed himself to God's keeping, and started. In 179 days (during half the nights he slept in his clothes) he made this journey of 12,000 miles, meeting with peoples whose customs are similar to those of the days of Abraham, and traversing districts now made prominent by the Russo-Afghan disputes. The general reader will find in the perusal of these volumes a treat of the rarest intellectual kind, but they contain besides an epitome of the latest researches made by Russian scientists in these regions, some of which we reproduce.

On the Thian Shan range, which may be reckoned amongst the chief mountains of the globe, the snow-line varies from 10,000 feet to over 15,000 feet above the level of the sea. The spruce fir is the most widely distributed tree along it. Its straight stem attains a height of from 70 to 90 feet, and its branches gradually shortening towards the top, give the tree the appearance of a pyramid. Its cones, the size of one's fist, are of dark blue, and hang at the end of long stems quite vertically. In the fir forests of this region, the trees stand apart so as to allow pedestrians and horsemen room for free passage. The fir grows in a region 6000 to 9000 feet above the sea; the birch, between 3000 and 8000; and the juniper, between 5000 and 10,000, except in the Alai, Turkistan, and Kissar ranges, where it reaches 1000 feet higher.

On the western Thian Shan, the upper and lower limits of the growth of trees run parallel to the line of perpetual snow, running from 8800 to 9800 feet. The juniper (*Juniperus pseudosabina*) is found up to 14,000 feet. Dr. Capus makes its lower limits from 4000 to 3800 feet. In the Alexandrof range, the farther to the west, the larger is the tree. At one spot the trunks are about 14 feet high, at another place 21 feet stems are from 14 to 18 inches thick. The high-stemmed junipers seen by Severtsoff had generally a bare trunk for half their height, the sparse branches measuring about one-fourth of the altitude of the tree, the top of which was generally broken. Above a certain height this tree

TRAVELLERS' ENCAMPMENT ON THE ROAD TO KULDJA.

becomes stunted, assuming an almost horizontal habit, with the branches only jutting upwards. Towards the south, where the woods decrease, the juniper grows higher, but it is replaced on the mountains by firs and birches. The limits of the birch tree (*Betula*, sp. not European) are from 3200 to 8800 feet; the lower limit depending upon the physiography of the valley in which it grows. The specimens are small, crooked, and with broken tops, probably from the snowfall. In the Kirghese Ala-Tau, the inferior limits of the birch and fir nearly coincide; whilst in the Kara-Bura mountains, the superior limit of the birch and the tall-stemmed junipers coincide with that of the sorb apple. Nineteen varieties of willow are found at heights varying from 5300 feet to 8000 feet. Of five kinds of poplars, that like the Russian aspen is found along the Talas; and on the river Kara-Bura are two thickets of similar large old trees, but of an intermediate form between the black poplar and the aspen. The Turanta poplar (*Populus diversifolia*) grows in the woods on the Arys. Two species of ash also adorn the gorges along the Boroldai and its affluents. The rare shrub called Boialysh (*Atraphaxis*) is found in the dry sandy clay lands at the mouth of the above river. The insignificant *Ephedra*, or jointed fir, flourishes in the grey parched soil of the Steppe, between the canals of the river Asa. Other small prickly shrubs with reddish flowers grow principally at an altitude between 4000 and 5000 feet. Neither gooseberry nor currant bushes were found in the gardens of Turkistan, though black and red currants are said to grow wild. In Kohistan, the honeysuckle, barberry, medlar, and sea buckthorn abound at a height of 8000 feet; whilst in the Chirchik mountains the wild plum, Pistachio nuts (*Pistacia vera*), and wild almonds are found 4000 feet lower. In Ablatoune, Dr. Capus found the superior limit of the nut and the wild apple to be about 4500 feet, with the ash (*Fraxinus sogdiana*), and a species of maple. In the same valley wild apricot trees grew up to 4000, and on the shores of the Iskander-kul even to 7000 feet. In the valleys of the Syr-daria grows a shrub on the thorns of which there collects a sugary material called *Yantak-shakar*, or Faran-jobin, but no such matter can be collected from the same shrub when grown on the mountains. From this plant, after rain, manna is collected, concerning which the Bokharists say that it falls early every morning during the three summer months, especially near the holy city of Turkistan, along the left bank of the Syr-daria, and may be collected up to sunrise; but with the first rays of the sun it becomes mixed with the soil, and sinks.

In the Takhta-Karacha Pass, between Samarkand and Kitab, Dr. Landsdell came on one of the plantations mentioned by General

Korolkoff which the Russians place on the mountains to keep the soil from washing down. Amongst the trees grown is a variety of poplar (*P. alba pyramidalis,* also *P. boleana*) almost unknown in Europe, but common in Central Asia, attaining there in from fifteen to twenty years proportions fit for building, and is sold from 10s. to 16s. the tree. The *Thuja orientalis* here attains to 70 feet. The elm, almond wood, white and black mulberry, and many European kinds of fruit trees, especially apples and pears, which attain only moderate perfection, are grown. More than 12,000 fruit trees were grafted the year of Dr. Landsdell's visit, in order to be given to the natives. In Samarkand, 1,000,000 forest saplings had been similarly distributed; and in the following spring it was expected that from 2,000,000 to 3,000,000 of such saplings would be distributed to the natives, who readily undertake their culture.

THE BUAM PASS ON THE ROAD TO ISSIK-KUL.

Melons are a most lucrative crop in Khiva. Kostenko estimates that, with good management, from 10,000 to 14,000 may be obtained from an acre, and those at 1¼d. each will bring from £50 to £70. Hung to the ceiling of cool chambers, certain kinds keep from the ripening season till the following May. They were sold at from 12s. to 20s. a hundred. Some are about the size of an apple, others a foot and a half long. Of the five kinds brought home to England by Dr. Landsdell, some have been successfully cultivated, others gave much promise, whilst the fruit of others was tasteless and insipid like those raised from seeds brought home by Burnaby and O'Donovan. Dr. Landsdell considers that two kinds may be grown in England, as demonstrated by Gray and Wildsmith.

THE AMERICAN FORESTRY BUREAU.

1. *Report of the Commissioner of Agriculture for the Year* 1884.
2. *Department of Agriculture: Report on Forestry.* Prepared by NATHANIEL H. EGLESTON. Vol. iv. Washington, 1884.

IT has been the custom of our caustic Japanese visitors to note as a striking peculiarity of British idiosyncrasy, our custom of appointing a Parliamentary Committee to search out details of some clamant grievance, apparently only to bury their report and details in a blue-book. On the whole, as we said last month, they do things better in America. The first of the two volumes now before us includes in its 600 octavo pages, with illustrative lithographs, reports from the chemist, botanist, entomologist, statistician, as well as the Commissioner of Agriculture, on all the subjects of pressing interest to farmers in the United States. In truth, each report is a separate book. It gives, besides, Reports of the Chiefs of the Bureau of Annual Industry and of Forestry. Four hundred thousand copies of this handsome well-bound volume are printed for distribution out of an appropriation of 200,000 dollars. The Report on Forestry is a similarly bound octavo of over 400 pages, containing, *inter alia*, reports on the conditions of tree-planting, lumbering, and timber supply over such a wide area as Washington Territory, the Prairie States, New Hampshire, and West Virginia, collected from replies sent to circulars issued by such agents as Messrs. F. B. Hough, F. P. Baker, J. P. Brown, and R. W. Furnas. The coloured diagrams of the percentage of woodlands in Ohio, is an unique feature of the volume; and so, too, is the map showing the distribution of production of maple sugar in the United States and Canada. But we might cloy the appetites of our readers were we to essay even a quantum of the plethora of forestal material before us. So it goes meanwhile to our shelves, to return to these pages in diverse forms.

We note the opening paragraph of Mr. Egleston's general report. Since the establishment of the Bureau, there has been an extensive correspondence from other countries, as well as from the area of the United States, making inquiries in regard to matters connected with forestry, such as the best methods of planting and managing trees, their value for various purposes, their adaptation to different soils and climates, the best methods of procuring, preserving, and planting seeds, and the like. As a mistake in tree-planting, unlike a farm crop, is one of a lifetime, and there are few experienced foresters in the United States, this department is simply inestimable. Perhaps Sir John Lubbock's Committee might report on such an organization as adapted to the forestal needs of Great Britain.

THE INDIAN FOREST SCHOOL, ETC.

Progress Report of the Working Plans Branch, North-Western Provinces and Oudh, for the Period from 1*st April* 1883 *to* 31*st October* 1884, *Supplementary to the Progress Report of Forest Administration in the North-Western Provinces and Oudh (School Circle) for* 1883–84. Home Department (Forests), Simla, the 1st May 1885.

THIS report by Mr. E. E. Fernandez, officiating Deputy-Director of the Forest School at Dehra Dun, though the briefest of those which have reached us this season, contains many items of general interest. From measurements and ring countings of deodars in the Dahra Gad Valley, the age of an average tree has been traced up to 210 years. In mapping the Dehra Dun forests, distinctive colours have been adopted to indicate distinctive areas of tree growth. Thus Sál has had green assigned to it; Sain, carmine; Sissu, blue; Bamboos, gamboge, and so on. In the case of two types intermixing on the same area, the one predominating was represented by a flat wash of its own characteristic colour, and the other by parallel lines, also of its own characteristic colour. So, too, when three or more types were mixed, the flat wash was used for the first, and parallel lines, of course, diversely coloured, were used for the others. Owing to the proximity of the forests to the river Ganges and the Ganges Canal, many species of trees, only accounted useful for firewood when farther from the river, are here exported as timber. Bamboos form the chief source of revenue.

The business of the Forest School engaged a large portion of the superintendent's time, occupying him for more than four hours every day of the session; and for the same reason, Mr. Brown could only devote about two and a half hours daily to the working plans, while Mr. Clifford could only give ten hours weekly to the same department. The vernacular forestry course, undertaken for the first time at the school, required special preparation to adapt it to the very limited receptive powers of the men deputed to attend it. But the enormous amount of work accomplished in the Dehra Dun forests was only possible through the aid of the students of the school.

Planting Trees in School Grounds and the Celebration of Arbor Day. Department of the Interior, Bureau of Education, Washington, United States. 1885.

HERE is a first book on educational forestal literature for English readers. Dr. Hough supplies a preface of practical directions for planting trees in school-grounds. Next comes the body of the pamphlet, compiled by Mr. Peaslee, superintendent of the Cincinnati Public Schools, which gives directions for the celebration of Arbor Day. After a historical preface by Mr. Highley, come lessons from history and other facts suitable for speakers taking part in the celebrations. The wants of the juvenile reciters are also supplied in selections in prose and verse, beginning with the biblical quotation, "The Tree of the field is Man's Life," and traversing the works of the best ancient and modern writers. One quotation from Lowell explains their nature :—

> "In June 'tis good to lie beneath a tree
> While the blithe season comforts every sense,
> Steeps all the brain in rest, and heals the heart,
> Brimming it o'er with sweetness unawares.
> Fragrant and silent as that rosy snow,
> Wherewith the pitying apple-tree fills up
> And tenderly lines some last-year robin's nest."

POLISH FORESTRY.

Forests and Forestry in Poland, Lithuania, the Ukraine, and the Baltic Provinces of Russia; with Notices of the Export of Timber from Memel, Dantzic, and Riga. Compiled by JOHN CROUMBIE BROWN, LL.D., etc. Edinburgh: Oliver & Boyd.

DR. BROWN'S long connection with St. Petersburg has afforded him special facilities for compiling this volume, which is one of a series originated because of the late International Forestry Exhibition, and is peculiarly apposite to current public events, including under this term alike the Russian crisis or Prince Bismark's protective policy in respect to German woods.

As readers of Dr. Brown's previous volumes might anticipate, this book abounds in gossipy anecdotes of travel reminiscences, or illustrations of the condition of the people question in the vast districts to which it relates. The story of the woes of Poland, whether in its past history or its present grinding tyranny, is graphically given. But the cream of the book lies in its forestal statistics; and its details on the trade and transport of timber. Chapter iii., on the Forests of the Dnieper, too long to quote, is compiled from Russian papers of high official value, not otherwise accessible to the English reader, and should be carefully studied by the politician and the wood merchant. This is the best of Dr. Brown's books on Russian forestry.

Manitoba Described: Being a Series of General Observations upon the Farming, Climate, Sport, Natural History, and Future Prospects of the Country. By Robert Miller Christy. With Maps. London: Wyman & Sons.

This cheap volume fully answers its purport as set forth in "the Introduction," where it professes to portray an impartial view of this new emigration field, alike devoid of the roseate hues to be found in emigration agency pamphlets, or the darker jeremiads of disappointed settlers. But the general reader with no idea of trying the Canadian Far West, the forester especially, will find much to interest. The chapters on Climate and Prairie Fires are alone worth the trifling money value placed on the book.

Professor Selwyn has no doubt that at different times almost every square mile of country between Red River and the Rocky Mountains has been subject to forest fires, which have thus originated hundreds of miles of wide and almost treeless expanses of prairie. And Dr. R. Bell, Assistant Director of the Geological Survey, confirms these remarks of his chief. He observed that the aspens of the district south of Fort Ellice, where tracts of forest have been converted into prairie in an almost incredibly short time, burn much more readily than does the wood of the same tree in Ontario and Quebec, whilst the portions which escape total destruction by fire rot and disappear in the course of one or two years. Charred logs are dug up from a considerable depth below the surface of the open prairie. The working of gophers and badgers probably aids in this sudden disappearance of such stumps.

South Australia: Reports on planting Olives and Mulberries on Mallee Sands, and Dates in the Far North; also Wattle Cultivation generally in the Colony. By J. E. Brown, F.L.S., Conservator of Forests. Adelaide, 1884.

This quarto of twelve pages or so is replete with interesting matter. A large map shews the water springs are known in the northern territory of the colony, indicating the spots on which it is suggested oases of the date palm might be planted chiefly through the agency of telegraph stationmasters and line repairers. Farmers are instructed how to plant olives on the open lands at a cost of about 30s. or 40s. per acre. In some places the olives should come into full bearing between the tenth and twelfth year's growth, from which time the net yearly proceeds would be about £3 per acre. The mulberry grows readily in South Australia, there being six varieties of the white species, which is most esteemed for the production of silk. Mallee could be prepared, it is estimated, at a cost of £9, 10s. per acre to grow a crop of such trees. And as the mulberry comes into profitable use for silkworm feeding in four or five years after planting, giving a net profit derived from the silk of 2s. for each well-developed tree, a profit of £850 could be derived from fifty acres so planted. We have already noticed the vigorous inauguration of wattle culture for tanning purposes by Mr. Brown. But some of the facts as to the yield of tannin may interest home users. Thus the broad-leafed wattle, *Acacia pycnantha*, gave results similar to those obtained by Baron Mueller, who obtained from it when artificially dried 30 to 45 per cent. of tanning matter. The percentage of tannin does not diminish with age in healthy trees, though tree sickness at any stage of growth at once affects the yield. The bark upon the branches and twigs of this acacia was also found to contain a very high percentage of tannic acid.

Walks in Epping Forest. Edited by PERCY LINDLEY. With Illustrations. London: All booksellers. 1885.

HERE is a novelty in guide-books. The shape is oblong, adapted like a surveyor's field-book for the side pocket. Besides a handy map, full-sized illustrations of forest scenes adorn almost every second page, all reproduced from nature, and from photographs taken by the London Stereoscopic Company, and these are supplemented by smaller companion woodcuts. The *Walks* are written by the chief local authorities on this district of a manifold literature, and comprise cycling routes, and plain instructions for pedestrians, as well as the latest facts on the geology, archæology, and biology of the forest. Best of all, the ornamental cover of this booklet would befit any drawing-room table, whilst the price is sixpence!

The Pheasant and the Partridge: Notes on Treatment in Covert—in Pens—Sitting and Hatching—Feeding and Rearing—Diseases of Pheasants—Pheasant and Partridge Shooting, etc. By A. J. BURROWS, Land Steward, Pluckley, Kent. London: W. Rider & Son.

THE title of this *brochure* by our old contributor shows how he can appreciate the wants of busy men in a small space. The subject is akin to the pursuits of a majority of our readers; and we do not know where they will find it so succinctly yet so fully treated.

The Indian Forester for May must be interesting to Edinburgh readers. The detailed and graphic account of the Japanese Court at the late Forestry Exhibition, written by one of the able Indian forest officers who studied its contents, deserves a prominent place in this year's forestal literature.

MR. JOHN GRANT has recently re-issued, at a cheap price, Ablett's *English Trees and Tree-Planting*, noticed when it first appeared, but with the addition of sixteen illustrations of famous historical trees, reduced from Strutt's *Sylva Britannica*, the few remaining copies of which are held by Mr. Grant.

AS foresters have an indirect interest in tanning, it may be useful to note that in the *Tanners' and Curriers' Journal* for May and July are several interesting items regarding tanning barks.

OBITUARY.

JOHN COLQUHOUN, author of *The Moor and the Loch*, died at Edinburgh on the 27th May, in his 80th year. He was the son of the tenth baronet of Luss, and his mother was a daughter of Sir John Sinclair of Ulbster. In his boyhood, spent by Loch Lomond side, he acquired that zest for field sports and love of the creatures living the wild life of the mountain-side and forest, which induced him early to retire from the military profession to pursue the study of such phases of Scottish nature, ultimately to result in his book, now in its sixth edition, and as popular now as when issued forty years ago. Mr. Colquhoun has left a family of four sons and two daughters, both of whom have won their spurs in literature. Indeed, the eldest daughter is Mrs. Walford the novelist.

MR. JAMES WELSH, of Messrs. Dicksons & Co., nurserymen, Edinburgh, died on the 18th of June at Erickstane, near Moffat, whither he had gone to recruit his health. Mr. Welsh was a figure in the Scottish arboricultural world. We shall miss his quiet, suave manner, and quick business decision.

FOREST WORK FOR THE MONTH.

ENGLAND.

AFTER a cold May and a salubrious June, we may expect a warm and brilliant July favourable to the gathering of the hay crop, and to the luxuriance and mature perfection of our cereals. The general characteristics of the month are clearness and heat; with occasional thunderstorms. The mean average rainfall is about 2½ inches, and the evaporation about 4½ inches. Last year the rainfalls were recorded at different places as under:—

At Greenwich,	rain fell on	16	days, to a depth of	1·76	inches.
At Edinburgh,	,,	22	,,	4·63	,,
At Glasgow,	,,	25	,,	6·15	,,
At Bristol,	,,	19	,,	3·66	,,

still indicating the heavier rainfall along the western division of the country.

ORCHARD.—Young fruit trees require a good deal of attention to train them into developing good stems and habits. Prune dwarf trees, by shortening shoots tending to over-luxuriance, checking the strongest first, and the others as they develop strength, but not enough to bare the foliage too much at a time.

FENCES should be kept clear of weeds, and when these have become strong before being hoed or cut down, it would be well to remove them to the compost heap, to be rotted into a manure. Continue clipping and dressing hedges where utility or ornamentation demands, and keep all fences in efficient repair, repainting iron and wood fences where necessary.

PLANTATIONS.—Continue, as circumstances will permit, to prepare land for autumn and winter planting, by fencing, draining, and preparing pits for the larger plants. Look through young plantings, and clear away all rank-growing vegetation likely to overtop or closely envelop the young trees, preventing a free circulation of air amongst their branchlets, and excluding the beneficent effects of the summer sun. I consider summer pruning very essential amongst trees that have been planted a few years, and believe the use of the pocket knife, standard tree-pruner, or other suitable instrument should be freely used in shortening contending shoots, and removing other growths that mar the balance and symmetry of the individual trees. If this treatment were more general, it would tend to the production of finer timber, and avoid the necessity of amputating large branches during any period of the tree's growth.

WOODS.—Clean up the tops and lops of the summer cuttings; and if practicable, get the timber, and all other heavy cartings, done while the rides and roads are dry and hard. Where this work is left until the autumn and winter, the mischief done to the roadways is not easily remedied, and the effects are not easily rubbed out.

TRANSPLANTING of Coniferæ and various evergreens may be successfully performed during this month, and in August, while in their luxuriance, if the work is done with sufficient care. Plants of almost any size may be successfully transplanted by suitable apparatus, some of which have been in use for many years, and proved their efficiency in various parts of the country.

NURSERY.—The chief injunction is, Keep down weeds, and remove them to the rubbish or compost heap as they are hoed and raked from the ground. Hand-weed seed-beds, and keep the hoe going amongst the nursery stock. Untie and re-secure grafts, and rub off all undergrowths. Turn over pits of hawthorn, mountain ash, holly, and other seeds, to enhance their regular decomposition, and maintain them in a wholesome state. Bud ornamental trees towards the end of the month, and slacken and retie the ligatures in about ten days or a fortnight afterwards; and in about a fortnight later they may be removed altogether.

COMPOST heaps should be turned over to hasten decomposition. If largely composed of earthy matter, lime should be freely incorporated with the mixture; but if of weeds and other vegetable matter, a lavish mixing of salt is very beneficial in destroying the vitality of noxious seeds, and insect eggs, and converting the compound into an excellent fertilizer. A. PATERSON.

PAULTONS, ROMSEY, HANTS

SCOTLAND.

THIS is still the season of the year when as little disturbance as possible should be given to the breeding and general game covert. Not a few late broods are yet unhatched, and young pheasants especially should not be disturbed. The hen pheasant at best, and under the most favouring circumstances, is by no means a good and affectionate nurse, like the partridge and grouse, and has therefore all the less need of being distracted or alienated from her young. The forester's work should therefore be so far arranged that little or no disturbance be given to the preserve till at least the end of the month.

Amongst other works that can be done advantageously at this time of the year, may be mentioned, all kinds of painting, tarring, whitewashing, varnishing, creosoting, etc., applicable to gates, fences, bridges, and outside woodwork generally.

The bark, in whatever condition, should be well looked to, that it do not contract mould, and must have strict attention till out of hand and delivered to the purchaser.

The nursery, shrubbery, and osier or willow beds should be constantly hoed and raked with at least the twofold object of keeping down the weeds and keeping out the drought.

As very much of the comfort and pleasure of walking or driving in the woods depend upon the condition of the roads and walks, these, according to their kind, should be kept in good order. Grass and rank herbage of all kinds should be duly cut, the surface kept smooth and uniform, by levelling and rolling; overhanging and low-set branches lopped off, dead and withered boughs removed, and every unsightly and offensive object trimmed so as to make the woods pleasant to look at.

Young plantations, and specially those growing amongst brackens, nettles, and suchlike, must now be released before they expand and exclude the sun's rays; otherwise, if left till next month or later, the plants will in all likelihood be irrecoverably lost. A man one day clearing off bracken now, will do as much work, and to better perfection, than he would in six a month hence.

Young and recently-planted hedges should be thoroughly hoed and raked, which, in addition to killing the weeds, assists greatly in keeping out the drought and encouraging the plants to root.

The squirrel must also be sharply looked after, to see that no peeling is done. He prefers the Scotch fir of between fifteen and thirty years' growth to all others; but when nothing better is at hand, he uses the silver fir, and even the larch and spruce. He is usually found at his favourite occupation of peeling on the sunny side of the plantation, especially after a mild shower of rain.

The caterpillar, pine beetle, and other insects require attention. When the caterpillar is found early in the season upon young trees, it is usually in great clusters, and in that state they can very quickly be despatched by crushing them in the hand; but if allowed to spread, they are beyond human control.

Pinching of improper buds in the pinetum, nursery, or elsewhere, and also pruning in general, is a work that can be well done now. Seeds of the elm should be gathered, and sown at once, as when kept they lose their germinating property.

Trees intended to be cut in autumn, may now be marked with the brazer, especially those of the ornamental class, or others growing amongst them. It is only when many of our finest ornamental trees are in new and full leaf that they can properly be distinguished from others less rare or valuable, and therefore very special attention should be paid to the marking of them under the circumstances.

It is about this time of the year also that many specially interesting and instructive features both in the leaf, flower and fruit, or seed, are to be observed, and those who cannot find a better School of Forestry may learn in this much that is really and truly useful and edifying; and by going deep enough, a mine of information will be discovered possibly not to be met with in printed pages or diagrams.

C. Y. MICHIE.

CULLEN HOUSE.

WALES.

CONTINUE the preparation of ground to be planted next season. When ground is drained, and trenched or ploughed at this season of the year, it gives it time to get thoroughly dry and sweetened before being planted.

Young plantations will still require attention in the way of cleaning all rough herbage from the young plants, otherwise they will become drawn up, and lose their lower branches.

With the view of having hedges well furnished at the bottom, keep them thoroughly clean and free from herbage of all sorts. Keep fences of all sorts in good repair, and tar or varnish all wood and iron work during fine weather.

Finish up the pruning of hardwood trees as early as possible during the present month.

Owing to the cold and dryness of the season, late transplanted trees have not made great progress. It is therefore necessary that they should be watered wherever practicable.

Oak bark in most cases will now have been secured, or delivered to the tanner or merchant. Where the timber has not been dressed and removed, no time should be lost in doing so. The chief work in the nursery will be the keeping down of weeds; early attention in this simple matter often saves a great amount of labour.

LEWIS BAYNE.

KINMEL PARK, ABERGELE.

LEGAL.

THE VALUE OF LAND IN THE NEW FOREST.

The Earl of Ravensworth *v.* The London and South-Western Railway Company.

THE London and South-Western Railway Act of 1883, for the construction of the Bournemouth direct extension line, empowered the Company to pass through an estate of the Earl of Ravensworth in the parishes of Hordle and Milton New Forest villages, situate about five miles from the town of Lymington. About 125 acres of nearly 148, the area of the estate, are immediately affected by the construction of the proposed railway. The Company made the Earl an offer of £300 for 3 acres, 1 rood, 2 poles, but this was refused, and eventually the matter was brought before Under-Sheriff T. B. Woodham, Esq., and a jury, sitting in the Town Hall, Lymington, on the 21st May last.

Mr. Littler, Q.C., and Mr. E. W. Bullen were counsel for the claimant, and Mr. Marriott, Q.C., M.P., appeared for the Railway Company.

Mr. Littler, Q.C., in opening the case for the claimant, read a report by Sir J. Whittaker Ellis, of the firm of Messrs. Farebrother, Ellis, Clark, & Co., which stated that the portion of land lying to the south of the line embraced an area of 125 acres, and was acquired some years since by Lord Ravensworth, for the purpose of adding to and beautifying the "Stanleys" estate belonging to Mrs. Gunning Sutton, his mother-in-law, who had spared no pains or expense in forming it into one of the most charming residential estates on the south coast. Had it not been for this special purpose, Lord Ravensworth, who owned vast estates in the north, would never have purchased property in this neighbourhood. As, however, it was settled that Stanleys was to become the property of Lady Mary, his Lordship's daughter-in-law, Mrs. Gunning Sutton and Lord Ravensworth acquired some of the small properties adjoining, intending eventually to purchase the whole of them, so that the estate might be bounded on all sides by roads. Had not the Railway Company appeared on the scene, they would in due time have succeeded in their object. The purchases were made by either of them irrespective of which property the land adjoined, so that the two estates now intersected one another in such a manner as to make it evident that they were intended for one estate. It was therefore an exceptional hardship that the Company should come right through the centre, at once destroying the absolute privacy and seclusion which were among the chief elements of value. Taking, however, the properties as a separate estate, independent of Stanleys, it comprised a compact model farm and 125 acres of land, lying in a ring fence, and bounded on two sides by good roads, and possessed valuable residential features. The line entered it on the north side, and traversed almost the entire length of the northern side, severing nearly an acre of land, to which the Company would necessarily have to make a proper communication, and by the construction of it the residential value would be most seriously depreciated, and great difficulty would be found in getting any one to build on the property after its mutilation. Sir John's valuation of the property was as follows:—3 acres 1 rood 2 poles of the land at £100 per acre, £326, plus £610 for consequential damage to the remainder of the estate: 122 acres, at £5 per acre. He was also of opinion that the necessary accommodation works should be provided by the Company. The jury had not to consider the value of the land to the Company, but its worth to Lord Ravensworth, and what damage he suffered by the severance of it.

Sir J. Whittaker Ellis, who was called on Lord Ravensworth's behalf, estimated the damage at £1000. He thought £50 an acre a fair price for such land.

Mr. Tewson, of the firm of Messrs. Debenham, Tewson, Farmer, & Bridgewater, said the agricultural value of a strip of land taken in this way was not a fair test of value; it was just as much a test as would be the value of the oils, paint, and canvas, composing a picture by Turner, as compared with the finished article. Lord Ravensworth would have paid £100 an acre or more to secure the strip if he had needed it for the purposes of his estate. An owner ought not to be deprived of his property at a value estimated by the present depression of price in the land market; for no man sold land now unless he was obliged. He was of opinion that the railway depreciated the value of the estate £20 per cent.

Cross-examined by Mr. Marriott—A railway with a station a mile and a half off did not always depreciate the value of property, but in this case the circumstances were peculiar. A question of privacy was involved, and owners of this class of property did not much care whether they had a station a mile and a half off or three or four miles off; besides which, there was no obligation on the part of the Company to maintain a station there. There were cases in which he advised that land should be given for the purposes of a station, but those were in cases of building estates.

Mr. Marriott, on behalf of the Company, said the land really was not worth £100, but they were asked to pay £1000. The Company put a value of £30 an acre on the land, which was a higher value than that of land in this neighbourhood. The line, moreover, went through the very outskirts of the estate, where it would do least harm. For the compulsory purchase of land, the Company were in the habit of giving in towns £10 per cent. in excess of the actual value, and in the country £25 per cent., as a solatium for any inconvenience experienced.

Mr. Garrard, surveyor, said he had been thirty years with Mr. Clutton, surveyor to the Ecclesiastical Commissioners. His firm was now acting for the Railway Company in this district. He considered £25 an acre to be the full value of the land, and he did not think it would realize that if sold.

Cross-examined by Mr. Littler—Had put £32 an acre as the price of the land, but was willing to make it £40, with damage to one other acre. The total damage was £160 to Lord Ravensworth's estate.

Mr. Ryde, surveyor, said though he put £32 an acre on the land, and £25 per cent. for a forced sale, it was not worth that. The acre severed he put down as damaged to the extent of £30. He thought £150 to £160 was full compensation. The estate would sell more readily in consequence of this direct line to Bournemouth running through it.

Mr. J. B. Bird, surveyor, of Cowes, had known the district for a number of years, and valued largely in the neighbourhood during the last twenty-five years. Valued the land at £32 per acre, adding £25 per cent. for a forced sale. There was an acre severed, but that was not damaged, as there was an owner the other side; but still it should be paid for.

Mr. Lewis, auctioneer and surveyor, of Lymington, gave similar evidence; his valuation was the same as that of the previous witness.

The jury returned a verdict of £275.

Mrs. Gunning Sutton's claim will, it is understood, be the subject of an inquiry at a later date.

"UNCLEAN" TIMBER FROM EPPING FOREST.

J. CHILTON *v.* DEPUTY EAST.

RECENTLY at the Waltham Abbey County Court, before Mr. Judge Abdy, John Chilton, jun., of the Robin Hood, High Beech, licensed victualler, summoned Mr. Deputy East, of Buckhurst House, Buckhurst Hill, licensed victualler, proprietor of the Three

Nuns, Aldgate, to recover £14 for four cubic loads of hornbeam timber, at £3, 10s. per load. The plaintiff's solicitor stated how two van loads of timber were personally ordered by Mr. Deputy East of the plaintiff in November last. The timber was duly sent, and the delivery note signed by defendant's clerk. He did not know what the defence was, unless it was that contained in a letter written by the defendant, saying that the timber was not clean and the quantity greater than he ordered. The defendant inspected the timber, and no warranty was given. Defendant said only two loads were ordered, whereas he was instructed that two van loads were ordered, which would amount to four cubic loads.

The plaintiff, in the course of his evidence, said that the defendant admitted that he did not know much about dealing in timber, but he had been travelling through Belgium the previous year, and had purchased two cargoes of hornbeam timber as a speculation, and had the timber sent to England and landed on the river Wye—(Mr. Deputy East: River Exe)—and that the speculation had turned out so well that he had made sufficient profit to pay all expenses of the tour and to leave a margin besides. Defendant further said that he believed he knew persons to whom he could dispose of some of the timber witness had in store.

After hearing a number of witnesses in evidence, the Judge observed that by clean hornbeam, was meant straight timber free from knots. The timber in question seemed to have been full of knots and crooked. His Honour reserved his decision.

HIGHLAND RIGHT OF WAY CASE.

JOHN MALCOLM *v.* THOMAS LLOYD.

THE trial of this action before Lord Kinnear and a jury, in the Court of Session, Edinburgh, which has lasted three days, was concluded on the 18th June. The pursuer, the proprietor of Portalloch, Argyleshire, sought declarator of servitude of a right of way against Thomas Lloyd, heritable proprietor of the estate of Minard. The pursuer is proprietor of the farm of Achaleek, and the issues submitted to the jury were:—(1) Whether for forty years prior to 7th January 1885, or for time immemorial, the pursuer and his predecessors and authors have possessed for all purposes a road leading in a south-easterly direction from the farm of Achaleek through the lands of Minard, belonging to the defender, to the public road leading along Loch Fyne side, and which road prior to the year 1854 ran in or near the Black Mill Loch, and thereafter on a new road constructed by the proprietors in that year; (2) whether for forty years prior to 7th January 1885, or for time immemorial, the pursuer and his predecessors and authors have possessed a road, leading as aforesaid, for the passage of horses and cattle.

The jury, after an absence of fifty-five minutes, returned a verdict for the pursuer, finding, on the first issue, that he had established his claim to a road for all purposes except for carts prior to 1854, and for carts since then; and, on the second issue, that he had established his claim to a road for the passage of horses, but not cattle.

SALES.

SALE OF TIMBER AT PLUCKLEY, KENT.

AT the large annual sale of timber upon the estate of Sir Edward Cholmeley Dering, Bart., of Surrenden-Dering, which was held on the 15th inst., the following prices were realized :—

Oak timber,	. from	1/3	to	1/11 per foot.
Oak blackrinds,	. „	3/6	„	6/6 each.
Ash, .	. „	1/2	„	2/ per foot.
Elm, .	. „	9d.	„	1/ „ „
Cherry tree,	. „	6d.	„	8d. „ „

The attendance of timber merchants and others was numerous, and the competition was brisk. These annual sales are deservedly popular, as the whole of the extensive woodlands upon the estate are thoroughly drained, carefully thinned out and pruned, and receive every necessary attention. The periodical planting up of the oak, ash, Spanish chestnut, larch, birch, spruce, Scotch fir, and other quarters is a work of considerable magnitude; and the ravages of the ground game for some years past have made this a serious matter. From 50,000 to 90,000 trees are put out each year. And in order to lessen the expense of replanting, a large home-nursery has been established by the steward of the estate, Mr. A. J. Burrows. This is now equal to the requirements of the woodlands.

Situated as this estate is in the celebrated hop-growing district of East Kent, the demand for poles is great; and this is met by annual sales of large breadths of coppicing and underwood. The income derived from this source alone is from four to five times greater than the rent of the land when under the plough. And as the system adopted is the growth of underwood with standards, the income is still further augmented by the thinnings at the end of every rotation. The oak bark of the present season has realized £4, 5s. per ton in the woods, the purchaser paying for delivery.

CHEMISTRY.

THE EXTRACTION OF TANNIN FROM OAK-WOOD.

ACCORDING to the *Revue des Eaux et Forêts,* oak-wood is a drug in France as well as with ourselves. But industrial chemistry appears to have opened there a new market for its profitable use in the extraction of tanning material. M. E. Henry describes in the May number of our contemporary how M. Luc, an extensive tanner in Nancy, has developed on the commercial scale a new patent process by which the old stumps and larger branches of the oak are made to yield to profit the chemical necessary for his industry. Saplings and the younger branches are rejected, but the other refuse material, cut into a shape like firewood, and having, contrary to the recommendation of the patentee, the bark retained, is placed in large cisterns, similar to those used as lye-washers in chemical works, in which boiling water circulates, becoming, as it follows a systematic course, more and more charged with tannin and other soluble material in the wood. When it has thus gone through four of such caves, this concentrated material is subjected to a cooling process, in this case a serpentine of cold water, the temperature is reduced to 30 to 35 degrees Cent., and blood with a small quantity of sulphuric acid added: the gums, mucilages, and solid matters which have mingled with the tannin in the solution are thus precipitated; and the clarified juice is concentrated in a vacuum pan until the extract stands at 20 to 25 degrees of the aerometer, and in this state it is preferred by tanners to the more dilute extracts ordinarily used. The spent wood is used as fuel.

GAS FROM FIR SHAVINGS.

MR. GEORGE WALKER, of Desoronto, Ontario, has obtained from this material, on the commercial scale, no less than from 20,000 to 30,000 cubic feet of capital illuminating gas per ton of dried shavings. The retorts used are similar to those in use for the distillation of ordinary gas coal. But the bye-products are different. While coal-tar and ammonic sulphate go so far as they do to make up the profit side in the balance-sheets of our gas companies, resinous woods, though yielding a superior gas, will not be employed. But may not this new manufacture pave the way for the utilization of gas engines for many estate purposes? It struck us as a lack at the late Forestry Exhibition that one of several gas engines shown at work, should not have been driven by gas from wood refuse.

CHIPS.

THE TREE IN PRINTING HOUSE SQUARE. —The ancient tree which Mr. John Walter, M.P., preserved with much care in the square of the *Times* office, fell on the same day that Mr. Gladstone, the eminent tree-feller, resigned. Is this "an omen"? The tree was a mystery to most people. Its foliage was unlike any other met with in London. Some South Americans visiting the office are said to have recognised it at once as a specimen of the striped maple. Some one has suggested that it may have been a specimen of the Becu—a South American and South African drug. One authority on arboriculture christened it a Sophora from Brazil. But it was really a specimen of the bush *Ptelia trifoliata*, allied to the elm, a native of North America.

TEACHINGS OF THE PAST WINTER.—I never knew a harder winter than the past one; but it has taught us many a lesson. We learn that, for general cultivation in bleak and exposed places, deciduous trees and shrubs are preferable to evergreen ones; the Austrian and Scotch pines are unexcelled among their kind for shelter-belts, and the white spruce among its kind; that evergreens of every kind are, if unsheltered, injured by long-lasting, north-west, zero winds; and that in case of in-any-way tender trees or shrubs and especially evergreens, or those to be set out in cold or bleak situations, the spring time is by far the most favourable season in which to transplant them.—WILLIAM FALCONER in *Rural New Yorker*.

THE WILD BLACK CHERRY.—A correspondent of the *Philadelphia Press* says: "I never saw the wild black cherry growing naturally on the prairie, and yet it grows well when planted." If he would look carefully into the forests skirting the prairies, he would see about the same number of cherry in proportion to the whole number of trees as he could find in any of our forests. It is an exceptional tree like the black walnut. You will read of the oak woods, the beech woods and the pine woods, but you never heard of the black walnut woods nor the black cherry woods. The black cherry has made wonderful progress in establishing itself on the prairies, not that it is better adapted to prairie soils than many other trees; indeed, it is at its best in loamy soils and will make as rapid growth on soils less rich, and will never make a healthy tree in low, moist soils. Circumstances have favoured it beyond any other upland tree in making its advances far into the prairie. In the first place, it was more generally distributed around the prairie borders than any other upland tree. When the plough had scarcely entered the prairies of Northern Illinois, it could be seen working its way along the zig-zag rail fences of Southern Michigan as it can now be seen pushing out into the prairies of Illinois, Iowa, Kansas, Nebraska, Wisconsin and Southern Dakota, and to this advance it is entirely indebted to the birds and the fences. Pigeons, mourning doves, robins, catbirds and thrushes feed on the cherries, as do the cedar birds, in flocks, and alight on the fences to feed their young. The seeds drop, and in a few years the seedling trees which spring from them produce cherries, and these seeds are carried still farther on. It may be noticed that the board fences are not so good as the old-fashioned rail fences to encourage the seedling growth. Few of our trees have so wide a distribution as the same black cherry. From Florida to the lower British provinces in the East and through the Western States far out into Kansas it flourishes. Mr. Fuller, in his *Practical Forestry*, states that it is found as far north as the woods about Hudson's Bay. But this is probably a mistake. The yellow cherry is a more northern tree, and may easily have been confounded with the black species. After careful searching and inquiry, I have failed to find it in Northern Minnesota and Northern Dakota. Even in Northern Wisconsin it is replaced by the yellow cherry. I sent a few hundred plants of the black cherry to a gentleman in the extreme north of Minnesota. He has planted largely and successfully many other species, but pronounces the cherry not hardy at that latitude. He is trying again this season, and so are others in that region to whom I have sent trees to be tested.—ROBERT DOUGLASS.

ORIGIN OF THE CEREALS.—Recent numbers of *Naturen* contain interesting papers by Professor Schübeler, on the original habitat of some of the cereals, and the subsequent cultivation in the Scandinavian lands and Iceland of barley and rye more especially. It would appear that barley was cultivated before other cereals in Scandinavia, and that the generic term "corn" was applied among Northmen to this grain only from the oldest times, and that in the Norwegian laws of the seventeenth and eighteenth centuries wherever reference was made to the "*Kornskat*"—or standard by which land in the Northern lands was, and still is, rated in accordance with the corn it is capable of yielding—the term was understood to apply to barley. Proof of the high latitude to which the cultivation was carried in early ages is afforded by the Egil's Saga, where mention is made of a barn in Helgeland (65° N. lat.) used for the storing of corn, and which was so large that tables could be spread within it for the entertainment of 800 guests. In Iceland, barley was cultivated from the time of its colonization, in 870, till the middle of the fourteenth century, or, according to Jón Storrason, as lately as 1400. From that period down to our own times, barley has not been grown in Iceland with any systematic attention, the islanders being dependent on the home country for their supplies of corn. In the last century, however, various attempts were made both by the Danish Government and private individuals to obtain home-grown corn in Iceland, and the success with which these endeavours were attended gives additional importance to the systematic undertaking, which has been set on foot by Dr. Schübeler and others, within the last three years, for the introduction into the island of the hardier cereals, vegetables, and fruits. As many as 382 samples of seeds of ornamental and useful plants, most of which were collected from the neighbourhood of Christiania, are now being cultivated at Reykjavik, under the special direction of the local government doctor, Herr Schierbeck, who succeeded in 1883 in cutting barley ninety-eight days after the sowing of the seed, which had come from Alten (70° N. lat.). And here it may be observed that this seems the polar limit in Norway for anything like good barley crops. The seed is generally sown at the end of May, and in favourable seasons it may be cut at the end of August; the growth of the stalk being often 2½ inches in twenty-four hours. North of 60° or 61°, barley cannot be successfully grown in Norway at more than from 1800 to 2000 feet above the sea-level. In Sweden, the polar limit is about 68° or 66°; but even there, as in Finland, night-frosts prove very destructive to the young barley. In some of the fjeld valleys of Norway, on the other hand, barley may, in favourable seasons, be cut eight or nine weeks after its sowing, and thus two crops may be reaped in one summer. According even to a tradition current in Thelemarken, a farm there owes its name *Triset* to the *three* crops reaped in the land in one year! Rye early came into use as a breadstuff in Scandinavia; and in 1490 the Norwegian Council of State issued an ordinance, making it obligatory on every peasant to lay down a certain proportion of his land in rye. In Norway, the polar limit of summer rye is about 69°, and that of winter rye about 61°; but in Sweden it has been carried along the coast as far north as 65°. The summer rye crops are generally sown and fit for cutting about the same time as barley, although occasionally in Southern Norway less than ninety days are required for their full maturity.—*Nature.*

WHY CERTAIN KINDS OF TIMBER PREVAIL IN CERTAIN LOCALITIES.—During the past two years my work has been on and about the Wabash river banks and its bottoms (flooded plains), and I have discovered why it is that in some parts of these bottoms one kind of timber, as sycamore, will take complete possession of a few acres, while at, or near by, the cotton-wood will prevail almost to the exclusion of everything else, and at other places the soft or water maple will do likewise, and still at another the water elm will monopolize all the space on which a grown tree can stand for several acres.

It comes about in this way: The balls of the sycamore, after undergoing the winter's freeze, are dissolved so that the separate needle-like or more properly pin-like seeds (as the outer end has the germ of the root, and swells into a bulb like a pin head) are blown by the wind, the little "fuzz" they hold enabling them to float a great way both in wind and on water. They begin falling early in the spring months, and if a flood is receding at the time, they stick to the soft, moist banks wherever they touch them, and particularly along the highest part of the sand-bars. Were it not for the subsequent floods the same spring, there could no other trees grow, as the sycamore, being the first to shed, would seed all the tree-growing space (each large tree bearing one hundred and fifty million seeds), and their broad leaves would shade the ground till nothing else could sprout. But during their early infancy they are easily killed by an overflow, and this ill-fortune happens to the greater portion of them.

The cotton-wood is the next in order of shedding seed. If another flood is receding while the cotton-wood is shedding, this flood will have killed all the sycamores, which it covered for only a few days, and will sprout all the cotton-wood seed that may fall on and along the banks and bars. As the earlier floods are generally the highest, there will be some sycamores not reached by the following floods, and they will hold sway along that margin. If, when the cotton-woods are a few inches high, another flood follows, they too will be killed to the extent that they are kept under water for a few days.

Next to the cotton-wood the soft, or bottom, maple sheds its seeds. If a flood is receding, this seed will occupy all the space, as, having a smaller leaf than the sycamore or cotton-wood, they will grow closer together. They in turn may be killed by a flood when they are very young.

I have forgotten the exact time that each of these trees sheds its seeds; something will, of course, depend on the forwardness of the spring. But along the Wabash banks, last spring, I could see three belts of young trees, and distinguish them by their general appearance. The farther off, the plainer these belts show, till lost to view. The upper belt was sycamore, the second (downward) cotton-wood, and the third soft maple. In June following there came a bigger flood than any that caused the seeds to sprout, and killed all of them. There was a bigger flood in the preceding February, but no seed fell then.

It will sometimes happen that the flood that plants the sycamores will be the last one for that year; and when they have lived through one summer, they are safe from any danger from overflow. In still other seasons, it will happen to favour the cotton-wood, or the maple, or elm, or willow. New bars are all the time extending from the lower ends of the old ones; and as the elevation of these will be such as to be sometimes flooded once and not again for that year, the trees that shed their seed with the flood that barely covers such bars, will plant them to overflowing fulness of their kind; and once they are secured from other floods, they live out their time of two hundred to three hundred years.

The upper surface of the interior of the bottoms (back from the rivers) is built up by sedimentation, and when built above the height of the average floods, the burr oak, black walnut, buckeye, pawpaw, and bottom hickory make their appearance. Such sycamores, cotton-woods, and maples as live long enough are relegated to the interior (as very few of them do) by the bottoms building riverward away from them. They die at the end of three hundred years at most, and leave no heirs to the soil.—JOHN T. CAMPBELL in *American Naturalist*.

ANSWER TO TREE CONUNDRUM:—

1. Pear. Tea.
2. Hop.
3. Beech.
4. Spruce.
5. Tulip. Yew.
6. Bay.
7. Peaches.
8. Judas.
9. Fir.
10. Pine.
11. Date.
12. Weeping willow.
13. Ivy.
14. Spindle.
15. Caper.
16. Sycamore.
17. Locust.
18. Plane.
19. Medlar.
20. India rubber. Sago palm.
21. Fig. Damson.
22. Chestnut.
23. Lilac.
24. Honeysuckle.
25. Citron.
26. Woodbine.
27. Broom.
28. Basswood.
29. Vine.
30. Rose.
31. Satinwood. Aloe.
32. (H)elm.
33. Arbor-vitæ.
34. Dyewoods.
35. Southernwood.
36. Cork.
37. Smoke. Hazel.
38. Elder.
39. Poplar.
40. Wayfaring.
41. Birch.
42. Ash.
43. Coffee.
44. Palm.
45. Aspen.
46. Deadly nightshade.
47. Breadfruit.
48. Orange.
49. (O)live.

FORESTRY

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EDITORIAL NOTES.

Squirrels and Horse-Chestnuts.—On June 21st we received some small terminal twigs of horse-chestnuts growing in Little Somborne Park, near Stockbridge, Hants, belonging to Sir Frederick Henry-Bathurst, Bart., representing eight or nine fine chestnuts, which had ten days or so previously assumed a very withered and tattered appearance. Mr. Morley, the agent of the property, suspected this to be the work of an insect; and mindful that we had stated in January number that all the chestnuts in the neighbourhood of Nantes had died, though it was uncertain whether the insect found on them was the cause or result of the disease, the parcel was despatched to Miss Ormerod for her decision. That lady, after the study of fresh specimens, could not find a trace of *insect* working, but as squirrels are very numerous, attributed this to their work. When first seen, the marks of three teeth in the pith could be detected, resembling squirrels' teeth, though no one had ever seen them gnawing the shoots. "In one case," writes Miss Ormerod, "the length of the woody part of the shoot has been removed, and the cut part at the top is almost as cleanly severed as by a knife,—the bark in this instance having been sufficiently untouched to connect the tip of the shoot with the lower part." Mr. Gibson, naturalist in the Edinburgh Museum of Science and Art, says that the above branches, which were subsequently submitted to him, still exhibit distinct traces of rodents' (squirrels') teeth. Now though Bell long ago noted that the squirrel delights in nuts, acorns, beech, and slender shoots generally, how comes it that it never perceptibly developed this fondness for horse-chestnuts in this locality till June 1885? Is this the development of a new taste caused by this year's specially luxuriant foliage? It may be well to note that the squirrel hides its food in varied reservoirs away from its nest.

The Scottish Arboricultural Society's Annual Meeting.—We have again to call attention to the date of this meeting, as well as those of the subsequent excursions, with their incidental arrangements as to trains and hotel accommodation. Intending excursionists should at once communicate with Mr. M'Laren, so that the indispensable arrangements for a pleasant "outing" may be made.

Sir John Lubbock's Parliamentary Committee.—This movement is now in working trim. The House of Commons have nominated the following of their number the Select Committee on Forestry:—

Mr. Wm. Corbet, Dr. Farquharson, Mr. Fremantle, Mr. Wm. Henry Gladstone, Sir G. Macpherson Grant, Sir John Kennaway, Sir Edmund Lechmere, Sir John Lubbock, Dr. Lyons, Sir Herbert Maxwell, Colonel Nolan, Colonel King-Harman, Mr. Parnell, Mr. Plunket, Mr. Portman, Mr. Round, Mr. Seely, jun., Mr. Moore Stevens, and Mr. Villiers Stuart. Sir John Lubbock has been appointed chairman; and the Committee have already begun to take evidence.

Despite the individual preference expressed in the House by the present Chief Commissioner of H.M. Woods and Forests for Coopers Hill as the site of the future School of Forestry, the Edinburgh Committee for promoting the Scottish Forest School are hopeful that the claims of their institution may be recognised. We understand that they have determined to suspend active operations meanwhile, till the Select Committee of the House of Commons issues some certain sound.

Diseased Elms.—At a meeting in London, Dr. Masters mentioned that an avenue of elms fifteen years old, in Guernsey, had some thirty or forty trees dying without any apparent cause.

New Zealand.—Sir J. Vogel has announced his intention to bring a bill into the New Zealand Parliament at its next session to preserve the forest trees of the colony, as well as to promote tree-planting on Government lands. Professor Kirk, formerly curator for the Auckland Acclimatization Society, and whose fame has spread in British botanical circles, will probably be appointed to carry out the provisions of the Act.

Chicory Cultivation in Otago.—Already forty acres are in crop this season at Messrs. Gregg & Co.'s Chicory farm and mill at Inchclutha; and next year fifty acres will be sown. The colonial chicory is said to far surpass that imported by our coffee merchants from Holland. Fully a dozen hands already find constant work on the Otago plantation.

EDINBURGH NEWS NOTES.

THIS year visitors to the Scottish Arboricultural Society's annual meeting can only reckon on a day in Edinburgh, which will be crowded with the proper business of the Convocation. What need then is there of any directions where to go and what to see away from the Botanic Gardens themselves? Still, odd minutes may not be unprofitably spent immediately outside the student's class-room. Around this meeting-place the magnificent show of roses will at once attract the eye; while the broad walk traversing the length of the glass houses leads directly to the Arboretum; and printed labels point the tourists to the Palm House or the Rock Garden.

Immediately beyond the central entrance from the garden will be found the plot of the Arboretum's Rosaceæ; and the arrangement there of the different varieties of this natural order is fairly typical of the similar treatment of the other representative orders of British trees and shrubs, whether along the walk which the roses bound towards the east, or along the other walks north and south; the subdivisions of which are duly indicated by well-printed labels containing both the popular and botanical names. The stranger has here one of the three views, the others are Blackford and Arthur Seat hill-tops, which must always be taken fully to appreciate the landscape effects of the serried crags and tapering spires of the grey metropolis of the north. When the natural wood replaces the present saplings of the Arboretum, Sir Robert Christison's ideas of the landscape capacities of the spot will be realized. Surely the Arboricultural Society might pass a resolution calling on the Treasury to give the adequate support originally anticipated for this national undertaking.

In the Garden as in the Arboretum proper, traces of Mr. Lindsay's energetic management are not to be sought for. The Rock Garden and surrounding Pinetum will fully repay a leisurely half-hour visit; while the unusual development of leafage and foliage —specially in the variegated forms of Taxus, Biota, Retinospora, and other conifers—may even in August be observable.

Outside the Herbarium building, huge stumps of Ballochbui Pine remind the visitor that the Scottish School of Forestry and Museum is yet but a wilderness project, having no local habitation. And the query is as naturally suggested, Why divorce it from the site originally proposed? Is the Royal Botanic Garden an institution for practical researches in applied science, or a public pleasure-ground? is a question which has been raised from two other standpoints during the past winter. It may be most readily answered in the first way, which was its object at its origin, by a less exclusive attention to medicine and morphology. If Government accepts private aid for it in the gift and continuance of its library from the Botanical Society, may it not enlarge the precedent? If not, Edinburgh sorely lacks a free public library. The taxpayers have more than once declined to take advantage of the Acts of Parliament to originate such an institution. Many think that with the advantages of the Advocates' and other public libraries, district libraries would answer the city needs better than a great public institution. Now, the Botanical Society's library at the Royal Botanic Garden already serves the purposes of a free library; another similar place of literary instruction will soon be given to the public at the Museum of Science and Art; could the Museum of Forestry and Library find a local habitation through the liberality of the Town Council somewhere in East Princes Street Gardens, a series of such local libraries would be instituted. Of course there would be no novels or poems, but then foresters never stoop down to, but always lead up, the public taste. The place, too, would be near such displays of horticulture as the periodic flower shows, the last of which in July with its gorgeous rose display I can only now note. And country foresters would not experience the somewhat inconvenient distance from railways involved in a visit to the Botanic Garden.

Mr. Ruskin has nobly departed from the ordinary type of things by confining the St. George's Museum at Sheffield to a modest cottage, to be visited by real students. The following is part of what is printed on the notice-board: "A Museum is, be it observed, primarily, not at all a place of entertainment, but a place of education. And a Museum is, be it secondly observed, not a place of elementary education, but for that of already far-advanced scholars. And it is by no means the same thing as a parish school, or a Sunday school, or a day school, or even—the Brighton Aquarium."

A resting-place like this in Princes Street, serving as a rendezvous for foresters and horticulturists, would thus serve a different purpose than Chambers Street Museum, whose forest gallery is at present worthy of a fresh visit. Of course you ask me what of the professor, and his University connection. All well,—if obtainable; if not, demonstration classes might fill meanwhile the educational void. But this is only the opinion of DIXI.

THE AMERICAN ASSOCIATION OF NURSERYMEN, SEEDSMEN, AND FLORISTS.

THE tenth annual convention of this Association was held at Chicago on the 17th, 18th, and 19th of June last; when nearly 400 persons attended. President Edgar Sanders, in his annual address, stated that this was now practically a nurseryman's association, as the florists had branched off and proposed to hold a separate convention at Chicago in August. A monthly trade journal was much required.

An interesting discussion ensued from the reading of a paper on "The Effect on Distant Removal of Trees and Plants," by Mr. W. F. Heikes of Huntsville, Ala., who said that as a rule there is a prejudice against moving a tree north or south of its usual or natural locality. For instance, a Baldwin apple tree grown in the north, and afterwards taken south, does not do well, and *vice versa*. On the other hand, if it is always changed into places in the same latitude, it will succeed well. Le Compte pears will thrive well either north or south, independent of locality of propagation. Planters should always procure stock from districts where good sound wood is grown, as a locality which does this is all that is necessary. No matter where a tree is propagated, it will retain its characteristics and peculiarities wherever planted. Thus an American elm transplanted in England remains the same as in its native country.

American fruits have their own particular "belts," out of which they do not grow well. A gentleman from Virginia said that the above remarks are only true of some varieties, for many fruit trees, as for instance the early harvest apple, will succeed equally well wherever changed. Mr. Hubbard, of New York, said that grape vines from Texas did better with him than those grown at home, and *vice versa*.

The above remarks are true of small fruits, but as a rule large trees will make good growth but do not mature fruit or flowers if taken to different latitudes.

In an open discussion on the employment of educated help in nurseries, Mr. Jenkins, of Minnesota, said that he had found it more remunerative to pay skilled men than use unskilled labour in his nurseries. Several speakers were of the same opinion, but one or two thought a skilled foreman was enough. All agreed that to have skilled men or experts in the business, a training in boyhood was necessary—a long apprenticeship in early years, as in other trades—and men who have been so trained up could always command good salaries.

In a paper on "Forestry Planting" by Mr. Foster, of Muscatine, Iowa, it was stated that Larch-planting had been disappointing; and White Willow and Catalpa are recommended to be planted instead of it. A Catalpa fence post will last fifty years; it is besides a beautiful wood for cabinet furniture, its grain being marked and distinct, while contrasting beautifully with cherry and black walnut.

The use of "Commercial Fertilizers on Fruit Trees and Ordinary Stock" attracted considerable attention, specially that of nitrate of soda. For various kinds of fruits this was found to be greatly beneficial, more especially on currants. In one instance a block of some 15,000 feet of strawberries was experimented with, and two-thirds of it liberally treated with this fertilizer, and the other portion left in its natural state. The plants treated showed wonderful progress and growth, and were rated as two-year-old plants, while the other could not be rated as more than ordinary "one-year-olds."

"Steam *versus* Hot Water in Hothouses," and "New Apples, how to produce them," were topics giving rise to interesting debates.

Reports on the amount of stock held throughout the different States of the Union, formed, as usual, a prominent feature in the proceedings of the Convention. The injustice of taxation of nursery stock was appealed against; and the extortionate character of railway transit charges was thoroughly exposed.

This, perhaps the best meeting of the Society, was terminated by a pleasant steamboat excursion on Lake Michigan.

THE BYE-TALKS OF THE CONVENTION, according to the *Prairie Farmer* of June 27th, were perhaps amongst the most important results of this three days' meeting of over 300 experts.

The Climatic Variation of Species was exhaustively discussed. The red cedar of Tennessee had been found tender in the Upper Mississippi Valley, while northern forms extended north and west to the Black Hills. The silver spruce of the west slopes of the Rockies had proved tender, while that from the east slopes was not only the hardiest but the prettiest of American conifers. . . . The Siberian fir, from seed from East Siberia, sunburns at Chicago, while those from the west slopes of Siberia and the Valley of the Amur are perfectly hardy. . . . The box elder from the Eastern States had proved as tender west as a peach tree, while the western form is hardy up to Lake Winnipeg.

Experiment Stations.—These suggestions led to the discussions on the need for experimental stations with a view to the introduction of economic trees, shrubs, and plants from like climates.

Varieties and Propagation of the Cherry.—The clean sweep of the cherry trees by the past severe winters led to constant queries in regard to the cherries on trial from the east plain of Europe. This will result in the importation of many thousands of small trees next winter, of the varieties grown on the plains east of the Carpathians in Europe. . . . The need of a hardier stock for the cherry was also discussed *pro* and *con.* Those who root-grafted on Mazzard roots had no trouble in the way of root-killing, while budded trees left the tender stock so near the surface that it had been root-killed.

Best Methods of Grafting and Storing Root-Grafts of cherry, plum, and pear were talked of. Experts in root-grafting agreed: (1) That scions should be kept dry. (2) That side grafting is best. (3) That modern linseed oil should not be used, but that wax softened with alcohol is best. (4) That quite dry packing is best for cherry after grafting, and that dirt cellars, with earth covering, are safest and best for keeping regular and perfect air conditions of cellar. If cellars are used with dry cold walls overhead, on which the moisture of the air is condensed in cold weather, the air becomes too dry. In the early spring such walls also tend to heat the air, and start the buds prematurely. Instances were given of perfect success in root-grafting the cherry when stored in old dirt caves, and perfect failure when in the best of modern cellars with cold rooms of approved construction overhead.

Commercial and Home Varieties of the Apple.—The widespread losses of nursery and orchard trees the past winter, and indeed of the past three winters, of standard sorts, such as Jonathan, Dominie, Grimes' Golden, Ben Davis, Willow, etc., led to long discussions in regard to changes of list. Many contended that no change was needed, as these extreme seasons are very infrequent; while an equal or greater number contended that our planters would lose faith and quit all attempts to grow the apple, over a large portion of the west, if confined to varieties liable to fail when nicely coming into bearing. . . .

The Hardy Catalpa.—The growing of this plant by the million for grove-making on the prairies, has received a check by the losses of the past winter. The veteran Robert Douglas did not hesitate to remind growers that he had not recommended it for planting as a timber tree north of the 41st parallel. A fruit tree injured by winter may linger along for several years, and produce much marketable fruit, but the timber tree with injured patches of trunk and dead terminal branches cannot produce sound and perfect wood. It is useless to say that such winters may not recur often in a lifetime. Another may occur within five years, or even one.

HIGHLAND SOCIETY'S PRIZE ESSAY ON ROSS-SHIRE FORESTRY.

MY attention having been directed to a Report on the Woods and Forests of Ross-shire by W. F. Gunn, Nutwood, Strathpeffer, and especially to where he refers to the woods on Novar estate, the property of R. C. Munro Ferguson, M.P. for the counties of Ross and Cromarty, would you kindly allow me, through the medium of your journal, to correct some mistakes which occur in the said report?

In the first place, Mr. Gunn says that the acreage under wood on Novar estate is nearly 2000 acres. The actual acreage under wood exceeds 4000 acres.

Then he notices a wood behind the village of Evanton, namely Evanton Wood, which he says has been all sold, and that about 80 acres have been entirely cleared.

This wood contains 172·153 acres, composed of Scots fir and larch as a principal crop, and is in some parts mixed with beech, oak, elm, ash, and spruce. About 35 acres were sold as a clean cut where the crop was principally larch, pretty much affected with what is known locally as *Roy*, a fair thinning being taken off the remainder, as the crop was very thick.

Mr. Gunn then goes on to say that along the sea-shore at Newton there are large-sized beech, oak, elm, and birch. Where he found these large trees I am at a loss to understand, as the only large trees there are ash and sycamore, also a fine clump of holly—one ash here measuring 12 feet in circumference, at 3 feet from the ground. There is also here a belt of young thriving wood, composed of ash, larch, fir, spruce, elm, sycamore, oak, and alder. Some of the hollies above mentioned measure 5 feet 10 inches in circumference, at 3 feet from the ground.

According to Mr. Gunn, Novar House stands among a few ornamental trees and some more hardwoods. It would thus appear that he does not consider as ornamental such common trees as fine old larches, Scots firs, limes, common and purple beeches, elms, oaks, walnuts, Spanish chestnuts, sycamores, birches, and poplars. The few ornamental trees which have taken Mr. Gunn's taste are cedars, Wellingtonias, *Picea pinsapo, Abies Menziesii, Cryptomaria Lobbii.* These are of no great size, but give promise of becoming very good specimens. I will here give the measurements of a few of the trees that are not considered ornamental by Mr. Gunn. I first take a larch that stands within a few yards of my own house, and within 60 yards of Novar House, which measures 11 feet 10 inches in circumference at 3 feet from the ground, has a clean straight trunk to the first branches of 50 feet, and contains 285 cubic feet of timber fit for the market. Near by stands an oak measuring 8 feet 4 inches in circumference, at 3 feet from the ground, having a clean bole of 40 feet, and containing 138 feet of timber. Within 30 yards of this there is an elm measuring 13 feet 11 inches circumference 3 feet up; near by, a purple beech having a spread of branches measuring 83 feet from side, and the trunk measuring 12 feet 1½ inch at 3 feet up. The trees are in good health, and in the opinion of many, more ornamental than many of the newer kinds. Before passing to other parts of the property, I would like to say a few words regarding a peculiarly-formed Scots fir which stands in the park in front of Novar House. This tree is said to be the oldest on the property, and is by no means a large tree, as it only measures 9 feet 3 inches round at 3 feet from the ground, and has a clean stem of 12 feet in height; and at the top it spreads all round in the shape of a huge umbrella, the extremity of the branches coming within reach of horses grazing in the park. It measures 56 feet from side to side at the extremity of the branches.

Mr. Gunn states that he understands that we gather seeds, but that we do not grow from our own seeds. Now we certainly do grow plants from our own seed, and only purchase when we cannot secure enough of our own. But we do not gather much seed off our old Scotch firs as recommended by Mr. Gunn, as we find that such seed often produces weak plants. We get our best seed from trees about 30 years of age which have grown naturally on the margins of our old woods.

Mr. Gunn says that little or no planting has been done for the last 80 years. Now some hundreds of acres of the woods are only from 50 to 60 years old, and the bulk of the wood from 60 to 75 years old, and a plantation of 230 acres at Kildermorie which is not more than 20 years old; and since March 1882, over 500 acres of ground have been planted. Certainly we have not planted at the foot of the Meanacrock, where Mr. Gunn represents patches to have been planted.

Mr. Gunn praises the larches in Meanacrock wood. He complains of the soil being wet, and says that the subsoil is blue clay and conglomerate, the fact being that the Meanacrock is covered with fine clean old Scots fir, soil yellowish loam overlying red and grey sandstone; and Mr. Gunn would have to sink 10 to 20 feet before he struck water.

Below this, towards the Cromarty Firth, there is Bogpiper wood, old Dhalgheal and young Dhalgheal woods, and in these we have a number of springs, but certainly the whole is well drained, as the timber which the soil carries will prove. The hardwoods here are of good quality, although Mr. Gunn does not think so, as it is here we get some of the best oak and elm crooks for boat-building.

Mr. Gunn refers to a hollow behind the Meanacrock, between it and Fyrish Hill, where he says there is a large extent of Scots fir about 40 years old; now Mr. Gunn simply contradicts himself by saying this, as he stated in a previous part of his report that little or no extent had been planted for the past 80 years. The fact is, that in the hollow referred to there is a considerable piece of bare ground, part of which is now enclosed and used as a nursery; and above this there is a considerable extent of Scots fir 105 years old, the lower part of which is fine heavy clean timber; higher up it becomes spar-wood, farther up props, then mere scrub.

I believe that about 16 years ago, a good many props were cut out of this wood, as stated by Mr. Gunn. This part is known as the Hill Lot, and contains 197·6 acres.

Mr. Gunn then goes on to say that "right round the southern face of Fyrish Hill there is a great extent of Scots fir and larch, which is mostly sold and now being cut."

It is true that there is a great extent of Scots fir and larch, but it is not mostly sold nor being cut. Last season there were a number of trees blown in the woods referred to, namely Fyrish wood, Black park, and Contullech wood. Part of this blown wood was used for estate purposes, and the remainder sold to Mr. Hall, wood merchant, Invergordon; but the woods are still very thick, and will soon require to be thinned.

Mr. Gunn says that squirrels are scarce. I wish they were. I have in one season secured as many as 1500 squirrels' tails, and when this season is finished I expect to have some 600 or 700 tails. These vermin are very destructive in this locality.

Regarding the prices stated by Mr. Gunn as being current in Ross-shire, I think they are, to say the least of them, misleading, and might be the means of making proprietors think their timber of more value than it really is at the present dull times.

The principal outlet for larch in Ross-shire is its conversion into railway sleepers, and herring-barrel staves, and heading; and for these purposes nothing like 1s. 6d. per cubic foot can be obtained. If Mr. Gunn will divide his figures by two, he will be nearer the mark, or at the most from 10d. to 11d. per cubic foot are the ruling prices.

By a little calculation, we will see what would be Mr. Gunn's profit or loss if he bought larch timber and converted it into sleepers and staves. Every timber merchant who manufactures sleepers out of rough wood knows that it takes on an average 3 cubic feet to make a sleeper.

Now 3 cubic feet at 1s. 6d. per foot, . .	£0	4	6
Then add cost of manufacturing and sending to market for every sleeper, . . .	0	0	11
Total, .	£0	5	5

And at the present moment this same sleeper would only fetch 2s. 10d. in Sunderland, less 2½ per cent. Now, allowing that Mr. Gunn could dispose of this sleeper in Ross-shire to the railway company here at their nearest station, he would save the cost of freight, dues, and insurance, which is equal to 5d. per sleeper, leaving 5s. still to be got for his sleeper; whereas the utmost that he can get for it is 2s. 10d., leaving a balance on the wrong side of the account of 2s. 2d.

If we then look at herring-barrel staves, and say Mr. Gunn pays 1s. 6d. per cubic foot for the larch, we will see that there would be a still greater loss than we had on sleepers. It will take from 75 to 80 cubic feet of timber to make 1000 superficial feet of ⅝ inch staves, oftener 80 than 75.

Say 80 cubic feet, at 1s. 6d. per foot, .	£6	0	0
Cross-cutting and carting to sawmill, .	0	3	0
Sawing, and tear and wear of machinery, .	0	6	6
Carting to station, measuring, and trucking,	0	3	6
Railway charges from Ross-shire to say Wick,	0	9	0
Total,	£7	2	0
Prices at present obtainable delivered at Wick,	3	10	0
	£3	12	0

Leaving a balance of £3, 12s. per 1000 superficial feet on the wrong side of the account. Again, from this it will be seen that from 6½d. to 7d. per cubic foot is nearer the price of stave wood larch, and we have before stated that a wood merchant can only afford to pay from 10d. to 11d. per cubic foot for sleeper larch. For picked larch suitable for railway carriage works, boat-building, etc., from 1s. 2d. to 1s. 4d. per cubic foot may be obtained, delivered at the consumer's yard; and when the cost of haulage to railway, and carriage, say to Inverness, Wick, or Fraserburgh, is deducted, should the seller find that he has 1s. per cubic foot left to pay the first cost, he may think himself lucky.

Regarding the prices of fir timber, Mr. Gunn would be nearer the mark if he reduced his figures from 8d. and 10d. to 4d. and 5d. per cubic foot. We are quite within the mark to say that every sleeper will cost 11d. to manufacture and send to Newcastle, and to deliver the same at Forres will cost 7d.; now one sleeper is equal to 3 cubic feet, this at 8d. per foot. Mr. Gunn's price gives a first cost of 2s. per sleeper; add to this cost of manufacturing and sending to Forres, and we have 2s. 7d.; and the Highland Railway Company get their fir sleepers delivered at Forres for 1s. 10d. each, thus giving a loss of 9d. per sleeper. The same sleepers delivered at Newcastle will only fetch from 1s. 10d. to 2s. each. The stave trade in fir would be equally unremunerative if the wood merchant paid 8d. per cubic foot for the timber, as the following figures will show:—

80 cubic feet at 8d., ...	£2	13	4
Cost of manufacturing and sending to Wick,	1	2	0
	£3	15	4
Highest prices at present obtainable at Wick for 1000 superficial feet, . .	2	14	0
	£1	1	4

Leaving 21s. 4d. of a clear loss to the wood merchant.

The prices Mr. Gunn quotes may be obtained if the trees are wanted for any special purpose, and the party purchasing very anxious to secure what will suit his purpose; but an exceptional sale of this kind is no rule to go by.

Mr. Gunn has considerably understated the prices obtainable in Ross-shire for sycamore (plane), as 2s. per cubic foot can be easily obtained for fair-sized timber of this sort. D. Robertson.

Novar, Evanton, Ross-shire, 17*th July* 1885.

FALLEN MONARCHS.

An aged and exceedingly picturesque ash of large dimensions, which for centuries had overhung and adorned the lake in the middle of Surrenden-Dering Park, in Kent, has within the last few days split in two, and the one half has toppled over into the water, whence its removal will be a task of considerable difficulty. The diameter of the divided trunk at 5 feet from the ground is 6 feet 10 inches, and the entire tree had a circumference of nearly 21 feet. It was one of the principal ornaments of this highly attractive park. In describing some scenery adjoining this lake a few years ago, I could state—"At its northern extremity stands an ash of gigantic proportions, some of its lower limbs towering aloft in sizes equal to the trunks of most of the surrounding timber trees, and other branches drooping gracefully to the surface of the lake, and then recurving and rising far above it. Where some of its limbs have been broken off, new growths start up at right angles to the old stumps, crossing and interlacing in such a manner as to charm the eye with their intricacies. Springing, as this tree does, from the base of a small escarpment of Kentish Rag, out of which issues a copious stream of the clearest water, and falls into the lake in the form of a small cascade; its huge roots run along the weather-worn face of the rock in endless contortions, binding up and holding together large masses which have become partially loosened by the action of the water and the atmosphere."

The loss of such a tree is greatly to be deplored. Its huge trunk had shown signs of splitting for some months, and I had contemplated arresting it by mechanical means. But the magnitude of the undertaking, consequent upon the enormous weight of branches overhanging the deep water, had deterred me. The great mass of foliage must have hastened its downfall, as the atmosphere at the time was unusually calm. It is a singular coincidence that a year ago, almost to the day, a very handsome cedar of Lebanon, growing upon the lawn here, and near to the mansion, toppled over upon just such another summer evening. The head of this was flat, and covered a great space, though the trunk was short. The circumference of this tree was 11 feet 6 inches, and its age—reckoned by the annual rings which were very distinctly traceable—was 169 years.

Thus depart the greatest external adornments of our country seats, and the glories of our parks and woodlands; teaching us the important lessons, which cannot be too often repeated, or too strongly impressed upon the minds of all landowners, and of those who have the charge of landed property, that it is their duty to maintain by constant planting and judicious tending both the ornamental plantations and the more serviceable or marketable portions of the woodlands. The paintings in the gallery represent the same scenes under the same aspects all the year round, and from year to year. But the out-of-door pictures vary with the season, and with the growth of their component parts; giving in spring the most delicate of hues; passing in summer to the height of gorgeousness; fading away in autumn to the mellowest and richest of tints; and displaying in winter the perfection and wealth of intricate ramifications.

I shall be pardoned for repeating here what I have stated elsewhere, viz. that whilst the mistakes of the farmer and of the gardener can be seen in a single season, and may be rectified the following year, those of the tree-planter take years to discover, and often more than a generation to rectify. Hence the necessity for the thorough training of the forester, and the establishment of a School of Forestry worthy of this great Empire, whose future timber supply must eventually depend largely upon its home growth, and the produce of its Colonies.

It is sincerely to be hoped that the Committee, over which Sir John Lubbock will so ably preside, will thoroughly investigate the subject, and take all the evidence obtainable from the most practical men.

A. J. BURROWS.

PLUCKLEY, KENT, *July* 17*th*, 1885.

THE BLACK WALNUT.

(Plate I.)

We present our readers with the first of our tree portraits, which in this case is that of the Black Walnut (*Juglans nigra*), one of the chief forest trees of North America. The other member of the order *Juglandaceæ* (*Juglans* is a corruption from Jupiter's nut), is the common walnut (*J. regia*), a native of Asia, from the Caucasus to China. Fig. 3*a* of the plate represents the male or staminate flowers, which are produced in rather short catkins, while Fig. 3*b* represents the fertile or pistillate flowers, which are in terminal pairs. Both flowers, it will thus be seen, grow on the same tree. The numerous toothed leaflets are hairy beneath. The nut is spherical, corrugated, edible, but not equal to the common walnut. Fig. 2 shows a spray of leaves, with a pair of mature nuts and a section of one. Its native habitat extends from western Massachusetts to eastern Nebraska and Kansas, and from Ontario, Canada, to Northern Florida and Texas. But in the districts between the great lakes and the Ohio river, giants used to be met with in abundance, of which still here and there remnants are to be found. Thus in Illinois a black walnut may be seen which measures 16 feet in circumference, and is without a limb to the height of 60 feet. The tree is a favourite one for groves so much recommended to be planted in the prairies by American sylviculturists; and it finds a place in Hemsley's *Handbook of Hardy Trees and Shrubs,* as an exotic capable of enduring in the British climate. It is best planted in America from the nuts, which are deposited in beds two or three inches deep, and lightly covered with earth or sand. After being kept moist through the winter, and subject to the action of frost, they sprout in spring, and are then taken up and planted where the tree is to grow. But for a time at least sheltering trees alternate with the young plants.

The early settlers used to work up the timber of this tree into fence posts and rails. But the new age of great cities has changed all that. The wood is fine-grained, and takes a high polish, its colour is a rich dark brown, deepening with age. It is unrivalled by any other native wood for purposes which demand a fine inside finish, and it fetches from £10 to £50 per 1000 feet, broad measure, in car-load lots in Chicago.

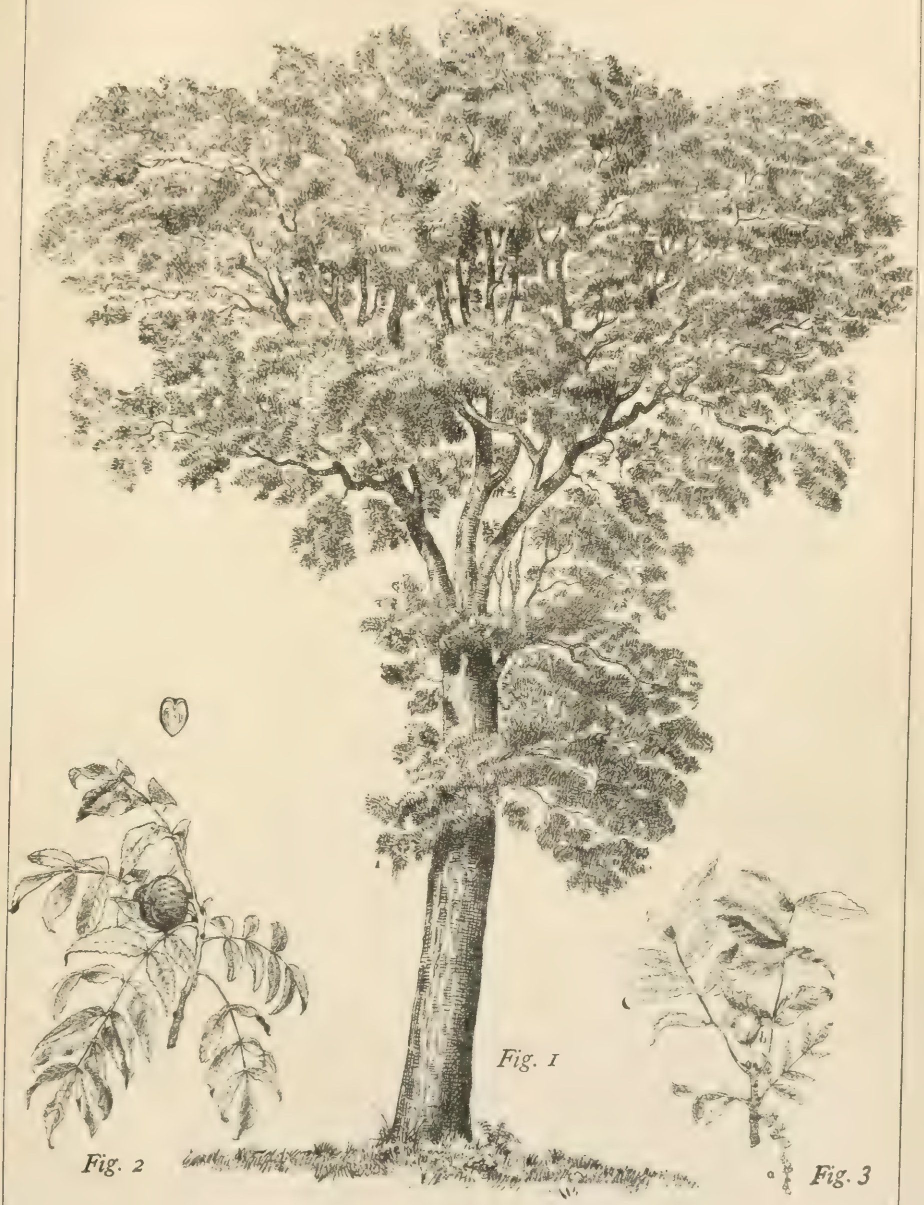


Fig. 2
Fig. 1
Fig. 3

THE DESTRUCTION OF CANADIAN FORESTS.

BY HENRY F. MOORE, FROME, SOMERSET.

IN Mr. J. H. Morgan's first preliminary Report to the Canadian Government, which has been just issued, he points out the reckless and destructive waste of the great forests of Canada and of the adjoining States, by fire and by the axe-man, and specially the rapidity with which the vast pine and spruce forests of Ontario and Quebec are being exhausted. In the United States the danger threatened by the destruction of the forests is so great that the attention of Congress was recently called to the matter in the Presidential Message; while the Secretary of the Interior says the rapidity with which that country is being stripped of its forests must alarm every thinking man, it being estimated on good authority, that at the present rate of cutting, the supply of timber will, in less than twenty years, fall considerably short of the country's necessities. In his address before the American Forestry Congress, at St. Paul, Minn., in August last, the Honourable George B. Loring, late United States Commissioner of Agriculture, said the destruction of the pine and spruce timber-supply was going on so rapidly that it would be necessary to allow the exhausted region to recuperate, while the comparatively uncut sections were resorted to to meet the demands of the market. Recent investigations showed that the supply of pine in New Hampshire and Vermont was exhausted; that the supply of spruce in the former State would last but 4 years, and in the latter 7; in Maine, pine would last 4 years, spruce 15 years; in South Carolina, pine would last 50 years; in California, 150; Georgia, 80; Louisiana, 100; North Carolina, 50; Mississippi, 150; Alabama, 90; Florida, 30; Texas, 250; Wisconsin, 20; Minnesota, 10; Michigan, 10; Arkansas, 50 years. Mr. Loring says there is no doubt that the exhausted forests in these States can be restored in time. Commenting on the above, Mr. Morgan points out that no allowance is made for destruction of forests by fire, nor is any reference made to the fact that lumbering in the Southern States has recently received an impetus which will add largely to the denudation of the land; that some Canadian lumbermen have been investing largely in timber lands in Arkansas and Louisiana, and are now actively engaged there in making and rafting timber; and that so soon as the railroads penetrate these hitherto untouched forests, the work of destruction there, similar to that which exhausted the supply in the older States, will, unless checked by wise legislation, very soon give cause for alarm.

Many railroads are now being built expressly to get out the timber that could not otherwise be marketed, the direct effect of which is to hasten the destruction already going on too fast. While this extensive cutting will keep up the supply at the mills so long as there are forests from which the supply can be obtained, it is every day hastening the ruin that must inevitably follow, unless prompt and adequate measures are taken to meet future wants by judicious and extensive planting, and by effectual measures for protecting and economizing the remaining supply. Should the effort now being made by the people of the Western States to have the import duties taken off lumber prove successful, the rapid increase in the demand would cause an exhaustion in the Canadian supplies which would, Mr. Morgan says, be fearful to contemplate. Respecting the probable duration of the timber supply in Canada under the present high pressure of cutting, Mr. Morgan does not attempt to fix any term in the absence of data to enable him to form an opinion. Alarmists place it at a very short period, while many think there is no apparent danger of scarcity of the necessary supply. Mr. Phipps, quoting Mr. Little and other authorities, puts the duration of Canadian supply, at the present rate of consumption, at ten years, and after alluding to statistics regarding forest fires, says: "We may well doubt whether we have five years' supply." This much, however, Mr. Morgan affirms, "that while there is no immediate danger of wood becoming so scarce in the Dominion that we shall have to send abroad for any, yet at the rate at which our commerce and our industries are growing—the building and repairing of railroads, telegraph and telephone posts, all causing heavy drafts on our supply—we may well be alarmed about providing for our future wants. In the past, forests have been the greatest source of wealth to Canada; the exports of lumber, since Confederation, amounting to the enormous sum of 330,520,000 dols., while the Provincial Governments, during the same period, have collected about 11,000,000 dols. in revenue on the product of the forests. This rich harvest cannot much longer be reaped, unless prompt measures are taken for the economic use, conservance, and reproduction of the woods."

The late Dr. Hough issued circulars to correspondents in the several States and Territories, with a view to ascertaining the extent of injuries caused by forest fires, and the causes and the methods of their prevention. One correspondent's suggestion is as follows:— "Open the eyes of the people to the danger, the immense destruction of property, the rapidly shrinking streams, the increase and duration of drought, the blighting of landscape, and the general climatic effect. This can be done by national publications fitted for the common people, not by documentary reports. Force these upon the attention of all by tracts and placards, in the places of summer resort, in lumbering camps, in all centres of population adjacent to the forests." Another says:—"By stringent national and State laws fastening responsibility upon careless guides and tourists, and also upon those who are clearing land. When a man wishes to burn a fallow piece, he should girdle it with a swathe. Responsible men who would not think of endangering their neighbours' houses with a bonfire in their gardens, think nothing of letting loose their fallow fires into adjoining timber." A detailed summary of the causes of fires shows that about 70 per cent. are attributable to carelessness, the greater part being avoidable, if not in the starting of the fires, to a great degree in the provisions that might be made for their suppression.

Referring to the vast area of prairie lands in the Canadian North-West with little or no timber, Mr. Morgan says:—"The climate of this vast territory is one of the healthiest in the world, but it is very cold, and ought therefore to have a large proportion of its area in woods. Woods would have a most beneficial and ameliorating effect on the climate. They would temper the cold winds of the spring, and retard the autumnal frosts. It is a well-established fact that the atmosphere of the woods in summer is much cooler as well as moister during the day than in open field, and that the reverse is the case during the night. So soon as the sun's rays leave the surface of the earth it chills very rapidly, and often in a dry climate, while the air at say 5 feet from the ground is moderately warm, the temperature of the earth is chilled by radiation, and often goes below the freezing-point, while the air at an elevation of 5 or 6 feet is several degrees warmer. The presence of woods would often avert these early frosts, more especially if the woods occupied the higher grounds. The moist, warm air from the woods would spread out over the fields after the sun had gone down, and act as a protecting mantle to the unripe crops, and become the means of averting what otherwise would be an almost certain danger. The drier the atmosphere, the more liable are we to refrigeration of the earth's surface, consequently the greater and the more imperative the necessity for planting forest trees in our North-West." Of the great necessity of tree-planting on the prairies there can be no practical doubt,—fuel and shelter being among the first wants of the settlers.

In respect to the contention of some scientists, that the character of the soil of some of the high plains is such that trees will not grow thereon, he cites, in refutation, the experience of the pioneers of the adjoining territories and States, which affords promise of unquestionable success. The work to be done is one of great magnitude, in which the Government, the railroads, the land companies, and the people must all take a share. The Government should, however, take the initiative, the first and most essential step being the establishment of experimental forestry stations at several points in Manitoba and the North-West Territories.

Having shown that the denuding of the country of its trees causes an abnormal condition of the rivers and streams, Mr. Morgan proceeds to inquire whether the reforesting of a fair proportion of the plains would not cause a change in the level of the waters of the Red River, the Saskatchewan, Assiniboine, and other rivers now subject to extremes of high and low water, and thinks it may reasonably be presumed that, if their banks and the neighbouring hills were clad with trees, whose foliage would protect the earth from the sun's rays and from the hot winds, the mosses and porous earth would hold and store the water till it found its way gradually to the rivers, preventing floods, causing a more regular water-level, prolonging the season of navigation, and contributing largely to the prosperity of the country. The work of desiccation is still advancing. Dr. Selwyn, in the Geological Survey Report of 1873–74, says:—"The lakes and lake basins are abundant. They appear to be gradually diminishing in size and drying up." On the other hand, in Utah, the Great Salt Lake, under the influence of the groves, orchards, and other plantations set out by the Mormons, and which now throw a grateful shade on the surrounding hills, has increased in magnitude, while many of the minor lakes and some of the rivers have increased their volume of water, and are not now so subject to extremes of high and low level. Before the American Forestry Congress in 1882, Mr. Emile Roth gave an interesting address on the influence of the absence of trees on the rivers of the prairies, illustrating his remarks by statements as to the present condition of the Upper Mississippi and its tributaries, their loss of water-supply, decreased water-power, frequent inundations, uncertain navigation, causing abrupt changes of temperature at all seasons of the year and late frosts in the spring. Speaking of Arizona, Mr. Roth says:—"The hills and slopes were once stocked with timber, which was wasted by the inhabitants, and the same deterioration of the country gradually took place there which we now notice in Palestine, Greece, and Sicily; and finally the people had to emigrate to avoid starvation."

In concluding this report, Mr. Morgan says it is not too late to repair much of the damage that has been done by the destruction of forests. Regulations for the use of the timber might be made without injury to the legitimate lumber trade; and the replanting and establishment of artificial forests may undoubtedly be made profitable for private as well as public enterprise. The forests of Manitoba and the North-West, now being slashed and wasted with great recklessness, should be kept as permanent reserves to supply the wants of settlers, the mature trees only being cut down. Millions of fine young trees are now being cut down, and their branches left to litter the ground, acting as conductors for the prairie fires. All the present forest land should be carefully surveyed, laid out in districts and charted, and the character and profile of the land described. Timber experts or competent wood-rangers should be sent to examine, appraise, and report on their value and availability. Enough has been shown, Mr. Morgan believes, to make it evident that it is the duty of the Government to adopt immediate measures to arrest the further destruction of remaining forests, except under some very improved system of supervision to replant, where practicable, the high lands formerly covered with forest trees, and to adopt some system of forest plantation for the great prairie region in our North-West. Of the great necessity for this there is no doubt, of the probability of success there can be none. The chief forester of the Northern Pacific Railway says:—"The fact that within the last ten years hundreds of groves, containing millions of healthy, vigorous young trees, are now growing far out in the treeless region, where science had pre-ordained and deemed the work an impossibility, must be acknowledged. The fact that young groves of forest trees are now being successfully grown on the line of the Northern Pacific Railway, away out beyond the 100th meridian, has also got to be admitted, science and its votaries to the contrary notwithstanding."

In most of the States, the failure of laws (whether for protection of forests or encouragement of arboriculture) to attain the desired result, has been not so much the fault of the laws as the absence of persons to see that they were properly enforced. In any system, the Government of the Dominion should, without loss of time, appoint a Forest Commission to co-operate with a similar Commission from every province in the Dominion, to deal with this all-important question of the protection of the old and the reproduction of new forests.

THE OTWAY FOREST.

A "VAGABOND," writing in the *Australasian*, descants on the beauties of this great forest of the Antipodes. The Victorian coast, from the mouth of the Gellibrand river westward of Cape Otway to Lorne on the east, was first traversed by the crew of the *Joanna* in 1843, who had been shipwrecked at Moonlight Head. On their way to Geelong they skirted forests of enormous timber. This was six years after Messrs. Gellibrand and Hesse were lost here. In 1851, Messrs. Wathen and Learmonth attempted to pierce the country, and "fought their way for two days inch by inch through the labyrinth of fallen trees without a mouthful of food for their horses." Mr. Wathen's report was: "Vegetation here is invested with a prodigal luxuriance quite tropical, and utterly unlike the tame monotony that characterizes Australian forests in the interior." The Government surveyors, Messrs. Skene, Smythe, and Scott, afterwards explored and reported on this district. Gold was sought for in the ranges, timber was in places cut for the railways, a few sawmills were established, and settlement took place here and there on the banks of the rivers. Yet even now, within a day's journey south of the Western Railway, and of important and early-settled townships, there is a long stretch of country a *terra incognita* to all but forest inspectors, energetic shire officials, and a few hardy pioneers. And these have not yet plucked out the heart of its mystery, or gauged the full extent of its resources, the richness of its soil, and value of its timber.

According to one expert, the forest contains a large percentage of blackwood, satin box, and beechwood, admirably adapted for railway carriage building; properly conserved, it would supply the construction and maintenance of the rolling stock of our railways for the next fifty years. Mr. Ferguson, Inspector-General of State Forests, writes: "I beg to say that in no other part of the colony have I met with so much huge timber of such fine quality, more especially the messmate and mountain ash, the forests of which in this region appear to be, as far as I have penetrated, inexhaustible." Mr. Ivey, secretary to the Central State Forest Board, states: "Both the blue-gum and messmate are in great perfection on this slope of the mount, and the forest here must become of immense value, if protected from fire, as soon as communication is opened up with the settled parts of the colony. A feature of this forest is the great abundance of the blackwood; no other forest in the colony contains such a wealth of this valuable timber." In December 1882, Mr. P. C. Moroney, engineer of the Colac shire, made a special exploration of the forest, and his report is even more enthusiastic. He says: "I must fail in attempting any adequate description of the grandeur and magnificence of the timber in this region, but can say it is not only unsurpassed but unequalled by any forest country I ever saw in Gipps Land, or indeed anywhere else. Gums and messmate grow side by side. The former, of a species with which I have not hitherto been acquainted, towers to a height of 150 feet, without a limb or excrescence upon its trunk, and the latter is scarcely less imposing in its growth and appearance. Their bottom girth varies from 10 to 15 feet, rarely exceeding the latter measurement, and the trunk shoots up straight and symmetrical. So closely do they grow, that in one patch on the hillside, not exceeding an acre in extent, I counted twenty-two of these fine trees, and detours into the valleys adjoining showed even greater prodigality of growth. On ascending to the summit of the range, the view, as far as the eye could reach, disclosed a similar forest. We cut into several trees, and found them dense in texture, hard, and sound. These trees seem, in nearly every instance, despite their splendid size, not yet to have fully reached their maturity—certainly not their period of decay—and in this particular differ greatly from their brethren in the Gipps Land forests. They also differ from them in rising from the ground with a full, round, well-proportioned trunk, instead of the great enlargements, or buttresses, which characterize the others; and this is of great importance, as the trees can be felled from the ground without scaffolding, and their entire length can be utilized, whereas in trees of like size in other places 20 feet or 30 feet of the base have to be left standing. This forest region seems to have suffered very little from the ravages of fire."

All this wealth of timber is of the greatest importance to the mining districts of Ballarat, and, indeed, to the colony generally. And where there are fine trees there is generally good land. Around Cape Otway itself 55 square miles are reserved as a State forest, but there is a vast area open to selection. Before the end of last year there was a slight rush to take up land under the conditions of the old Act. There were more than sixty applications for half-section blocks, principally from residents of Colac and district. These are chiefly situated in what is known as the "beech forest," some twenty-six miles due south of Colac, where there is reputed to be an area of very valuable country. The tree called sometimes birch or myrtle, Baron von Mueller writes me, is a true *fagus*. As such it was recognised in Tasmania by Allan Cunningham, in 1819, when he accompanied Captain King on his voyage of survey and exploration. This tree is found in the mountain valleys of Tasmania, and is allied to the evergreen small-leafed species of South America and New Zealand. In the latter country it is, I believe, commonly called birch. In Victoria it is found in the ranges near Dandenong. Baron von Mueller recorded it on Wilson's Promontory in 1853. It constitutes extensive forests on Mount Baw Baw, near the sources of the Yarra, Goulburn, Thomson, and Latrobe, as ascertained by the Baron when he ascended that mountain in 1860. This Australian *fagus*, first referred to by Allan Cunningham in *King's Voyages* (1827), was proclaimed a distinct species by Sir William Hooker, in 1840, as *Fagus Cunninghami.* Its excellent timber is known in the market as "Tasmanian Myrtle."

WILL IT PAY TO PLANT TIMBER IN AMERICA?

"NO," says Thomas Meehan, in the June number of the *Gardener's Monthly*, commenting on a report of the Ontario College, in which the income from a forestry plantation is estimated at 12 dols. per acre per year, for fifty years. Dr. Meehan says:—"Now this is no great showing. If one has a tract of land for fifty years, and has it in condition for agricultural uses, as this is required to be before the planting of the forest, the annual renting of the land would probably be much more than 12 dols. per acre. Certainly, we may set it down that the average rental of the land for that period would be that. There would be this income without any crop at all, the tenant making his living. Twenty-five dols. per year, at least, should be the average product of land of this kind. Unless some better showing than this can be made for forest planting, we fear no new forests would be put out."

But according to the *Philadelphia Press*, there is abundant land in the Atlantic States fit only for forestry; while in Pennsylvania alone, at the last census, the land in farms, amounting to a trifle more than two-thirds of the entire State, was worth less than 50 dols. per acre, so that a rent of 12 dols. per acre would be about one-quarter of the value of the land. "No doubt there is much land in the neighbourhood of cities, or with exceptional advantages for special purposes, which will rent for more than 12 dols. But as an average it is preposterously high. Take the country through and the farm land is worth less than 20 dols. per acre, and that too when much less than one-third of the nation's area is counted as occupied for agricultural purposes. If the 4,000,000 farms in the United States, which average 134 acres each, could be rented at the rate of 1600 dols. apiece, a large proportion of their owners would abandon agriculture at once and spend the summer in Europe."

Mr. B. G. Northrop says, in the *New England Homestead:*—"Over 10,000 acres in Plymouth and Barnstable counties, Mass., once sandy plains, as barren as those in Wallingford, Ct., are now covered with fine forests. The common pitch pine has there been most generally used for the reclamation of sand barrens. Recently the Scotch pine has been widely planted, and the European larch. The seeds were sometimes sowed broadcast, but usually dropped in furrows. 'Does it pay?' you ask. I have put that question to many farmers on Cape Cod, and always got an affirmative answer. One of them said: 'When I came to this spot twenty-five years ago, not a tree was to be seen from my house lot. The land could be bought for 25 to 50 c. an acre. Now that sand covered with trees, is worth 20 dols. an acre. Besides, it also paid me over and over in my enjoyment of the improved looks of my place.'"

Prof. Sargeant estimates that there are "in Massachusetts fully 200,000 acres of unimproved land which could with advantage be at once covered with larch plantations, and if so planted, their net yield, according to my estimate, in 50 years would be 1,045,660 dols."

Though there appears no need of placing the profits of a 100 acres of corn land against that of forest land, as Meehan does, still facts go to show that in the prairie districts tree-planting is a present profit. Mr. Anthony writes to Professor Budd, of Iowa, that since 1883 his firm has planted over 210,000 forest trees of different varieties grown from seed or nuts. And the *National Live Stock Journal* indicates that comfort in pasturage furnished by a grove of trees, means contentment for the cattle and profit for the owner. The writer in it some two years ago met, in the State of Iowa, a young gentleman from the old country who was looking for a place to establish himself as a stock farmer, and who was evidently fairly well supplied with the means to suit his tastes and disposition. Referring to a site he had found, which he regarded as in many respects eligible, he declared his only hesitation to be caused by the almost entire absence of trees growing on the place. "If there was a good growth of trees on the place," he added, "I would close with the owner at once, and willingly give him 5 dols. an acre more than he asks me." Now, on 240 acres this little matter of 5 dols. an acre would have made the nice little difference of 1200 dols., besides securing the bargain at once.

HISTORICAL NOTICE OF SOME CELEBRATED TREES.

BY THE LATE PROFESSOR WALKER ARNOTT, M.D.

Part III.—The Ash, Walnut, and Oak.

The Ash.

Of the ash (*Fraxinus excelsior*), few authentic accounts have been obtained from which either its age or rate of growth can be satisfactorily determined. One of the largest in Scotland, if not in Britain, deserves notice. It seems to have been long one of the protecting sentinels round the churchyard of the parish of Bonhill, in Dumbartonshire; no tradition exists of its age, which has in vain been endeavoured to be traced by means of the concentric layers of its stem; but it is said that about 200 years ago it was known by the name of the "big tree of Bonhill." The statistical account of the parish, in 1792, gives the following details:—"The ash tree in the churchyard of Bonhill deserves a particular description, being no less remarkable for its uncommon size than for its extensive spreading, and regularity of its branches. The trunk, immediately above the surface of the ground, is 25 feet in girth; 3 feet above the surface, it measures 19½ feet, and at the narrowest part 18 feet. It divides into three great branches; the girth of the largest is 11 feet, of the second 10 feet, and of the third 9 feet 2 inches. The branches hang down to within a few feet of the ground, and from the extremity of the branches on the one side to that of those on the other, it measures no less than 94 feet." The height is not mentioned, but it must have considerably exceeded 100 feet. Since 1792, one of the large branches was blown off by the wind, which much disfigured its form: its lateral twigs became thin, and it was shorn of its widely-expanding foliage. It was at length blown to the ground, November 1845; when down, it was found to be—at 3 feet above the root, 26 feet 2 inches; at the bifurcation, 22 feet 6 inches. If these measures were taken at precisely the same point as in 1792, we find the girth to have increased 6 feet 8 inches in 53 years, and consequently the tree could only have been about 208 years old; but this rate of increase, more than half an inch in diameter annually, is certainly much too high, so that the tree may have been much more ancient. There is still at Bonhill House the living skeleton of another ancient ash, which Nicol measured in 1784, and found then to have a circumference of 34 feet 1 inch.

THE WALNUT.

The walnut tree (*Juglan's regia*), the nut of Jove, and the Persian nut of Theophrastus, is found indigenous to the more northern parts of Persia, towards the Caucasus, and sometimes in the Russian territory to the north of these mountains. It is apt to be injured by the spring frosts of Europe, but in many parts it thrives well, and wherever it does thrive the wood is valuable; a fine tree has been often sold for several hundred pounds. It grows to a considerable size, and attains a great age. Evelyn relates that the architect Scannonzi saw a table made of a single piece from the trunk of a walnut, which was 25 feet in breadth, and of a proper length and thickness. It was upon this ample board that the Emperor Frederick III. gave a splendid entertainment in 1742. The age of the tree was calculated at nine centuries.

THE OAK.

In point of strength, durability, and general application, the oak (*Quercus robur*), the monarch of the woods, is the most important of all our timber trees. The trunk of this detached tree acquires by far the greatest diameter, some of the old hollow trees of this description having a diameter of as much as 16 feet in the cavity, and still a shell of timber on the outside sufficiently vigorous for producing leaves or even acorns. The age to which it can continue to vegetate, even after the core has been decayed, has not been fully ascertained; but in favourable situations it must be very considerable. Pliny speaks of oaks in the Hercynian forest, which he deems coeval with the world. Among the oldest still extant in England is the Parliament oak, in Clipstone Park (supposed to be the oldest park in England), which derives its name from a Parliament having been held under it by Edward the First, in 1290.

The oak in Yardley Chase has been thus immortalized by Cowper:

> "O couldst thou speak
> As in Dodona once thy kindred trees,
> Oracular, I would not curious ask
> The future, best unknown; but, at thy mouth,
> Inquisitive, the less ambiguous past!
> By thee I might correct, erroneous oft,
> The clock of history; facts and events
> Timing more punctual; unrecorded facts
> Recovering; and misstated, setting right."

The Winfarthing oak, now a bleached ruin, is said to have been called an old oak at the time of the Conquest. The oak in Melbury Park, Dorsetshire, is called by Mitchell, "as curly, surly, knotty an old monster as can be conceived." The Cowthorpe oak, in Yorkshire, has a trunk which measures 78 feet in circumference near the ground; and its age is estimated to be nearly coeval with the Christian era. The famous Welbeck oak was measured by Evelyn in 1660, and was found to be 33 feet 1 inch in circumference at 1 foot from the ground. It still existed in 1775, but much mutilated, and was then about 860 years old; its diameter at the base was 12 feet, so that it had increased a foot, or 144 lines, in 120 years, or little more than a line per annum, although on its whole life, its average annual increase was about 2 lines. Another oak at Bentley, which was very vigorous in 1776, was then found to be 33 feet 8 inches in girth at 5 feet above the ground, and is calculated to have been 810 years old.

In Holt forest, Hampshire, there was an oak, which at 7 feet from the ground was 34 feet in circumference in 1759.

Dr. Plott mentions an oak at Norbury, which was of the enormous girth of 45 feet; its age is unknown, but it was probably more than 1100 years. The Boddington oak, in the vale of Gloucester, was 54 feet in circumference at the base. The Fairlop oak, in Essex, though inferior in dimensions to these, was still of enormous size, being from 6 to 7 feet in diameter at 3 feet from the ground. Damory's oak, in Dorsetshire, is of a very large size; its girth was 68 feet, and the cavity of it which was 16 feet long and 20 feet high, was about the time of Cromwell used by an old man for the entertainment of travellers as an alehouse. The dreadful storm in 1703 shattered this majestic tree, and in 1755 its last traces were sold as firewood.

Among the traditions of this wonderful tree, the following will, we have no doubt, prove interesting to our readers. The large Golenos oak which was felled in the year 1810, for the use of His Majesty's navy, grew about four miles from the town of Newport, in Monmouthshire; the main trunk, at 10 feet long, produced 450 cubic feet; one limb 355, one do. 472, one do. 235, one do. 156, one do. 106, one do. 113, and six other limbs of inferior size averaged 93 feet each, making the whole number 2426 cubic feet of sound convertible timber. The bark was estimated at six tons; but as some of the heavy body bark was stolen out of the barge at Newport, the exact weight is not known. Five men were 20 days stripping and cutting down this tree; and a pair of sawyers were five months converting it, without losing a day (Sundays excepted). The money paid for converting only, independent of the expense of carriage, was £82; and the whole produce of the tree, when brought to market, was within a trifle of £600: it was bought standing for £405. The main trunk was 9½ feet in diameter, and in sawing it through, a stone was discovered, 6 feet from the ground, above a yard in the body of the tree, through which the saw cut; the stone was about 6 inches in diameter, and completely shut in, but round which there was not the least symptom of decay. The rings in its butt were carefully reckoned, and amounted to above four hundred in number, a convincing proof that this tree was in an improving state for upwards of 400 years; and as the ends of some of its branches were decayed, and had dropped off, it is presumed it had stood a great number of years after it had attained maturity.

Professor Walker, of Edinburgh, in his catalogue of remarkable Scottish trees, mentions several very fine oaks in Scotland. An oak at Lockwood, in Annandale, measured at 6 feet above the root, was 15 feet girth, among a number of others which nearly approached the same size, standing not less than 900 feet above the level of the sea. An oak at Blarquosh, in the parish of Strathblane, in Stirlingshire, the spread of the branches of which was 90 feet in diameter, measured 15 feet in girth at 4 feet from the ground. An oak in the Marquis of Tweeddale's grounds at Yester, in Haddingtonshire, at 1 foot from the ground, measures about 15 feet 5 inches; and at 6 feet, it is about 14 feet. The tree called the King of the wood, on the estate of Ferniehirst, near Jedburgh, is a beautiful, tall, straight oak of 80 feet in height. The girth of it is 18 feet above the roots, and at 15 feet it is 11 feet 6 inches in circumference, and it goes on tapering gradually for nearly three-fourths of its height. And the Capon tree, which grows near it, and which is much more picturesque in form, measures 21 feet above the roots. It speedily divides itself into two branches, which measure respectively 11 feet 6 inches and 14 feet. It is upwards of 70 feet high, and covers an area of 92 feet in diameter. These two trees are considered as remnants of the great forest of Jedwood. An oak at Barjarg, in Nithsdale, measured above the roots 17 feet; at the height of 16 feet, it girthed 11 feet 11 inches; at 32 feet high, it measured 11 feet 9 inches; and at the height of 46 feet, it was 6 feet 8 inches round. An oak upon Inch Marian, in Loch Lomond, which stands near the middle of the island, measured in 1784, 18 feet 1 inch. This tree is remarkable for its fine expanded head. The measurement of the famous Wallace oak, in the Torwood in Stirlingshire, taken in 1771, was 22 feet. There is another Wallace oak at Elderslee, near the place where Wallace was born. It is a very noble tree, 21 feet in circumference at the ground, and 13 feet 2 inches at 5 feet from the ground. It is 67 feet high, and its branches extend 45 feet east, 36 west, 30 south, and 25 north, covering altogether 19 English poles of ground. Wallace and three hundred of his men hid themselves from the English among the branches of this tree, which was then in full leaf. In a very old oak wood, on the north side of Loch Arkek, in Lochaber, there are, or were lately, many trees from 10 to 14 feet in girth, and one was there measured, which was found to be, at 4 feet above the root, 27 feet 6 inches.

In Samogitia, a province of Russian Lithuania, there were two oaks which were believed to have existed in the times of Paganism. One of them, situated at Bordza, having been greatly injured by an accidental conflagration, was cut down by the proprietor in 1812. It measured 41½ English feet in circumference at the base, and 28½ feet about the middle of the trunk at 18 feet from the ground: 710 concentric layers were distinctly counted on the transverse section from the circumference towards the centre, where the space in which the layers could not be clearly made out, was estimated to have comprised 300 more. If therefore the injured portion was not over-estimated, the tree must have been 1000 years old.

But these are much smaller oaks than one in the south of France, of which the following account has been inserted in the annals of the Agricultural Society of Rochelle:—"At about six miles west-south-west of Saintes (in the Lower Charente), near the road to Cozes, stands an old oak tree, in the large court of a modern mansion, which still promises to live many centuries, if the axe of some Vandal does not cut it down. The following are the proportions of the king of the forests of France, and probably of all Europe. The diameter of the trunk at the ground is from 9 to 10 yards (consequently its circumference is from 85 to 94 feet); at the height of a man, from 6½ to 7½ yards (that is, from 60 to 67 feet in circumference), the diameter of the whole head is from 40 to 43 yards, the height of the trunk 8 yards; the general height of the tree, 22 yards. A room has been cut out of the dead wood of the interior of the trunk, measuring from 9 to 12 feet in diameter and 9 feet high, and they have cut a circular seat out of the solid wood. They put a circular table in the middle, when it is wanted, around which twelve guests can sit. A door and a window admit daylight into this new sort of dining-room, which is adorned by a living carpet of ferns, fungi, lichen, and mosses. Upon a plate of wood taken from the trunk, about the height of the door, 200 annual rings have been counted; whence it results, in taking a horizontal radius from the exterior circumference to the centre of the oak, that there must have been from 1800 to 2000 of these rings, which makes its age nearly 2000 years." This would give on an average an annual increase of $1\frac{1}{2}$ line in diameter.

The American oaks can by no means vie with their brethren in Europe, either as to size or age, probably more on account of the close stifling growth of the primeval forests in that country, than of the woodman's axe. The Wadsworth oak, on the bank of the Genesee river, however, may be mentioned; it is of that species called the *white* oak, and has a circumference at the smallest part of the trunk, about 4 feet from the ground, of 22 feet 4 inches: towards the base it is nearly 27 feet. This noble tree is estimated to be 500 years old, giving as much as 2 lines for its average annual increase in diameter. The *live* oak, so called from the heavy and incorruptible nature of its wood, also grows to a good size: Bartram in his travels in Florida notices some from 12 to 18, or even 20 feet in girth; and the younger Michaux mentions a tree of this kind felled near Charleston, whose trunk was 24 feet in circumference. Mr. Nuttall says that in West Florida it sometimes acquires the diameter of 8 or 9 feet, and as these trees are of extremely slow growth, perhaps one line annually in diameter is as much as ought to be allowed for its increase; this would make such a tree nearly 1300 years old. Further information on this subject is, however, still requisite.

VARIEGATED AND ORNAMENTAL-LEAVED DECIDUOUS TREES AND SHRUBS.

EVERGREEN TREES, especially coniferæ and hollies, have been freely used in ornamental planting for many years, and with generally happy results. But the many beautiful variegated and tinted-leaved deciduous trees that are as easily obtainable have been comparatively neglected. The colour effects of flowers in ornamental woods and shrubberies are restricted to spring and early summer.

Late summer and autumn flowering trees and shrubs are very few—indeed, there are almost none worth naming; it is therefore very desirable that colour should be introduced by means of the judicious interspersion of deciduous trees and shrubs with coloured leaves in ornamental plantations. Of these coloured-leaved trees there are plenty obtainable in considerable variety of colour and habit, most of them also as hardy as their normal green types. But they don't seem to be generally known, or if known are certainly but rarely employed, and even then not always with the best results. For in many cases these trees are placed so as not to light up the otherwise dull masses of green surrounding them. Being rarely so vigorous and quick-growing as their neighbours, they are often overborne and obscured by them from the beginning. They are thus effectually kept in the shade, never yielding any signs of their native beauty.

Being mostly plants of comparatively slow growth, they must not be planted where they will be liable to injury from the encroachments of more robust neighbours. Shelter is desirable to all of them; to many it is indispensable, but it should be placed at such distance as to render the ill results of encroachment impossible. They should always be placed in foreground positions relatively to the shelter that is provided for them, so that their characteristic effect may be seen in relief of the more commonplace background. They may be planted on eminences where their effect may be a conspicuous feature in the immediate landscape, or in valleys where it may create sensations of surprise. They should always have a background which should be a distinct contrast in form particularly, but also in hue with the characteristics of each individual. In large and extensive surroundings, plant them in groups rather than in single trees, so as to proportion the effect to the general idea of the landscape as regards space.

I now proceed to note a few such trees and shrubs in alphabetical order.

The *Acer* (maple).—Many of the most beautiful varieties of this genus are not hardy except in the mildest and most favoured parts of the country. Specially so are the elegant Japanese maples—*A. polymorphum, japonicum,* etc. Besides, the unpronounceable native names disturb one enjoying their beauty when flourishing in the unheated winter garden or conservatory.

Acer colchicum rubrum.—This is a form of *A. platanoides,* the Norway maple. It attains rather bold proportions, and has a fine symmetrical habit; the leaves and young wood at the tips of the branches are tinted bright purple—pink from their early unfolding to their fall.

Lobel's maple (*A. platanoides Lobelio*) has something of the same purple tint in a young state or early in the season; but though one of the handsomest of maples, it cannot be regarded as striking in respect of colour.

The golden-margined maple (*A. platanoides aureo marginatum*) is a very handsome and effective variety, the leaves of which are, as the name implies, margined with golden yellow.

The variegated sycamore (*A. Pseudo-Platanus*) is a strikingly handsome variegated tree, but is surpassed in effect by Leopold's sycamore, which shows more colour in fully larger and more massive leaves.

The Corstorphine plane (*A. Pseudo-Platanus lutescens*) is the finest of this group. During the early part of the season of growth it assumes a bright golden hue, which it retains with somewhat diminishing effect till the end of its growing season. It is a vigorous grower, and altogether a noble and striking tree.

The ash-leaved variegated maple (*A. Negundo fraxinifolia*).—This is one of the most beautiful of silver-leaved trees where it succeeds well; but unfortunately it does not do well everywhere, being rather tender. It is very susceptible of injury from impurities of atmosphere and sea-breezes; succeeds best in a comparatively dry situation, well exposed to the sun, where it will ripen its growth well.

The golden alder (*Alnus glutinosa aurea*) and the purple-leaved form of the same species are the only two tinted varieties of the common alder at present known. They are both useful, but the first-named is the most effective and desirable. S. G. W.

THE JERUSALEM ARTICHOKE.

THE sunflower artichoke is being extensively cultivated in Belgium, as by a new process of distillation some 8 per cent. of alcohol can be obtained from its tubers. More than 3500 acres of poor, almost waste land, around Antwerp will this year be cropped with the plant. The residue after distillation is nutritious. France is thus also in the way of cultivating large stretches of her poor thin, chalky, and schistose soils with this new crop.

The cultivation of Jerusalem artichoke is very much the same as that for potatoes. February or March is the time to plant; the earlier, the better will be the yield. Indeed, if the soil be sufficiently friable, the planting may be made even in winter. Owing to the quantity of its foliage, the Jerusalem artichoke draws a great deal of its food from the atmosphere.

Artichokes are now being cultivated alike in Iowa and Arizona as a material for fattening pork. In field culture they are not hard to eradicate, and must be replanted at least once in two years. An Iowa farmer finds one or two acres sufficient for quite a large herd of hogs.

THE IRISH FOREST PROBLEM.

THIS question, raised in June by the remarkable evidence given by Professor Howitz before the Committee on Irish Industries, will soon come before Sir John Lubbock's more recently-appointed Committee, if the preponderating number of Irish Members of Parliament upon it affords any index to the scope of its inquiries. The sight of even five millions of acres in Ireland devoted to sylviculture, fostering such indigenous native industries as charcoal and basketmaking, is a pleasant one even in vision. Of course there are the obverse aspects of the question, which must be fairly discussed ere practical steps can be taken to realize the future epoch of forestal happiness so enthusiastically held by some to be in store for the Green Isle. So let us turn from imagery to facts.

According to Professor Hull, the Director of the Irish Geological Survey, there are roughly available for growing timber in Ireland about 3,500,000 imperial acres, divided as follows: Donegal, 500,000; Londonderry, 100,000; Mayo, 360,000; West Galway, 700,000, including Connemara; the Dingle promontory, 80,000; Kerry, 600,000; Cork, 400,000; Wicklow and Wexford and the mountainous district generally, 300,000; Downshire, 100,000; and the central district, 400,000. Professor Howitz made an extensive tour through Ireland in 1883 to ascertain how far the climate and soil were suitable for tree-planting. He reported on this to the House of Commons in January 1884. There appeared no doubt that Ireland was at one time covered with forests, specially of oaks. Very little of the soil of Ireland was not adapted for planting. The outer western ridge from the Giant's Causeway round to Killarney should be planted. Trees in Lord Powerscourt's demesnes showed indications of rapid growth. There was great similarity for forest purposes between Ireland and the west of America, where there are great forests. There was an absence of hedgerow timber in Ireland, but hedgerows were not advisable, because they took too much ground and too much nourishment from the soil. Orchards attached to farms were rare in Ireland. The climate of the south of Ireland was well adapted for fruit-growing, and orchards would be profitable. Wood charcoal could be made available for smelting iron. Grey willow made the best charcoal. Leaves of trees are largely used for litter in foreign countries. Hickory and walnut would grow well and furnish valuable timber in some parts of Ireland. The climate was especially suitable to the apple and pear. Oak bark was very valuable for tanning. Charcoal might be extensively produced, and used in manufacturing gunpowder, dyes, and polish.

More trees would obviate the present scarcity of birds, which is injurious to agriculture. Further, trees planted along rivers would tend to preserve the fish by providing shade. The great western shelter belt from the Giant's Causeway southwards, Professor Howitz said, would prevent deterioration of the soil, as well as modify the climate in the interior of the country. It should be a State operation, and the funds supplied from the Treasury, though administered by a Central Board in Dublin. To plant four millions of acres in Ireland would cost £20,000,000, and the money would be profitably expended. The cost of slit-planting on hilly ground would be about £5 an acre, and on low ground about £6 or £7. If willows were planted, after three years they would commence to realize £3 an acre, and rise to £20 an acre. Oak should be planted in the interior lowlands, and would give a return in from fifteen to twenty years after planting. Pines could be grown along the mountain-sides down to the water's edge. One acre in four should be forested, so that out of the 20,000,000 acres inland 5,000,000 should be forested. An important cottage industry might be created by osier-weaving. It was a fact that a very large quantity of the soil of Ireland was being wasted every year, and this could be checked by a certain amount of protective planting. It would not be too much to say that if proper care had been taken to preserve the forests of Ireland, as they existed 200 years ago, Ireland would now have forests to the value of £100,000,000.

Professor Howitz would have a paternal Government buy the land necessary for these great forestal reforms; or compel the proprietors to use their lands for this national purpose, of course under direction of the proposed public board. This fashion of avoiding the main difficulty of the problem is simply continental. And we suspect that evidence as to the admirable methods in which provincial associations like the Danish Turf and Moor Society assist individual efforts in sylviculture would have been more appropriate than magnificent schemes, somewhat approaching "tall talk." We indicate elsewhere that the Indian Forest Department, when placed in the position of requiring to purchase private lands for their Imperial schemes in Bengal, have found themselves in an intricate operation. Are we prepared to obtain the land necessary for the scheme by drastic measures in Ireland? Indeed there, as in America, an extensive popular education as to the advantages of governmental forestry must precede any beneficial legislation. How far this is needed has been well shown by "J. C." in the *The Irish Farm, Forest, and Garden.* He writes: "The ignorance that prevails is among the farmers, who have, as a rule, shown no disposition to plant for shelter, and the consequence is that the land is depreciating in value every year. I myself have known an instance (in the county Cork, too) where a landlord offered most suitable trees gratis to tenants on mountain farms, but not one of them availed themselves of the offer, though their land would have been doubled in value by planting their raised fences with trees. These were no uncertain holdings either. They enjoyed leases of thirty years, and were sure of renewals safer and longer than the Land Act affords. But trees are really so cheap, and the planting so easily and expeditiously done—at a time, too, when other farm work is not pressing—that there is no excuse for the farmer not entering at once upon a system of planting for the shelter of his stock. If such were generally adopted, we would be largely independent of the re-afforesting scheme, necessary and desirable as it is. There are no large forests in Meath to affect its climate, and yet remove the large hedgerows and hedgerow timber that so shelter the land, and it will soon lose its high reputation as a fattening county. There is no reason why the tenant farmer should not adopt this simple and inexpensive form of planting. He has full security for his outlay now—indeed he had such by registering his trees, even before the Land Act—and he will have the satisfaction of knowing that he will thus become a real benefactor to his country, whilst largely benefiting himself, by 'causing two blades of good grass to grow where but one bad blade grew before.'"

The operations of the Belleek Parish Association, county Fermanagh, instituted by Mr. J. C. Bloomfield, for the cultivation of osiers, and their manufacture into baskets, may, we hope, be but the first of many such local organizations. On visiting a basket-making district in England, Mr. Bloomfield found that the profits of this rough industry were sometimes estimated at £40 per acre.

Many railway companies have adopted a system of making the baskets used for the conveyance of perishable produce and of letting them out on hire; but while all such baskets are made in England, the rods used in them are imported from Holland. Procuring a pattern basket, Mr. Bloomfield employed a local creel-maker, who copied it in such a manner as to elicit from the manager of the London and North-Western Railway Company a declaration that a week's instruction would suffice to enable the man employed to produce as good a basket as any they had in store.

In order to develop this industry, a school is to be established in a large rough shed for the instruction of adults and youths in basketmaking—an instructor other than a resident being only necessary for a very limited time. It is proposed, in the beginning at least, to import from abroad the rods necessary to make the plain, common commercial baskets, of the different sizes and shapes suitable to meet the requirements of the railways, wine merchants, grocers, etc., together with the carrying exigencies of the General Post Office, whose parcel post basket contract is already estimated at £40,000 per annum. Now in the matter of the cultivation of osiers in Ireland, J. C.'s testimony is interesting, corresponding with what has already been adduced in these columns on their cultivation in England:—

"This is a form of planting than which none is more needed in Ireland, and none so suited to our requirements, or that will yield so quick and profitable a return. It can be grown, too, on land almost useless for other purposes, and will require in many cases such a trifling outlay in preparation of the soil that it has always been a mystery to me why the trade was not a flourishing one in Ireland. Seven years ago, in writing to you on the subject, I was able to state, on the authority of a Dublin basketmaker, that one cause, at least, of the anomaly was the high charges of the Irish railways—that he could have his willows at a cheaper rate from Rotterdam than from a midland county in Ireland."

All speed to such needed reforms as are thus indicated in railway charges. But enthusiastic advocates of Irish afforestation should remember to prove the diverse commercial conditions of success involved in more than one of their propositions. For instance, even though the geology of Erin is singular in having a magnificent carboniferous system, practically devoid of coal-beds, could its future supplies of wood fuel compete with the mineral supplies of the English coal-fields? Further, are the turpentine, resin, or wood-charcoal markets so capable of absorbing unlimited supplies, that prices may not be at the same time influenced? Foresters alone cannot afford to ignore supply and demand with their sometimes too serious national consequences, caused by artificial measures.

The French Forest Department have the charge of the restoration and conservation of mountain pasture lands. So the Irish forestal problem may legitimately embrace the further improvement of the country specially for stock-raising; merely keeping tree-planting as a means to such an end. Now Mr. G. H. Kinahan, of the Geological Survey of Ireland, has given evidence bearing on this before the Committee on Hibernian Industries. He thought great tracts of waste land might be acquired by the State, drained at a cost of about 25s. per acre, which would add 10 to 15 per cent. to their value, and then re-sold possibly to small proprietors. Half of this land would be suitable for culture; and a large quantity of the remainder would make excellent pasture-land; while we assume forests would form part of the scheme. Thus 4000 acres might be reclaimed from the estuary of the Sligo at a cost not exceeding £25 an acre, while the land so reclaimed would be worth £50 per acre. The climate would at the same time be improved. He strongly recommended the planting of willows between the banks of the rivers and the rivers themselves. This would have the effect of protecting the banks from the injurious effects of wind waves, and would shelter the land behind. Such efforts had been most useful in several parts of Limerick. When he was a boy a great basketmaking trade was carried on in Ireland, and willows were extensively grown in the lowlands; but this trade had almost entirely disappeared. There were, in his opinion, many sand-hills in Ireland which were now barren, and which might be utilized by planting in the same way as planting had been carried out in some parts of France. If they planted these sands with trees, the flow would be stopped, and much of the land behind could be brought under tillage. He knew that in some instances the planting of fir trees under these circumstances had failed to produce timber, but shelter had been given to the land, which in itself was of much benefit. In France, where there had been a failure to produce timber, the trees had yielded large quantities of turpentine and pitch, and he saw no reason why trees should not grow as well in Ireland, notwithstanding climatal differences.

The carrying out of a thoroughly scientific plan of forestry and land reclamation on lines embracing climatal amelioration through Ireland, by numerous local organizations, is apparently the bourne to which this evidence tends.

FRENCH PLANTING OF TIMBER ON POOR SOILS.

In the June *mid-Bulletin* of the Society of French Agriculturists, M. Renard shows that it is better to plant poor sandy soils now mostly covered with heather and furze, rather than to reclaim them for the cultivation of cereals or other root crops. In M. Renard's estate of the Park of Enbas, near the town of Houdan, the returns from root crops were small and irregular, only obtainable after large and constant application of artificial manures, while the frost of a night or so might destroy the husbandman's hopes for the season. Some clumps of *Pinus Sylvestris*, whose height reminded one of its stately magnificence in Norway and Sweden, standing in 400 acres of moorland of the 700 acres or so of the estate, determined the new proprietor in 1867 to devote the whole area to sylviculture; and he has since systematically pursued such a policy with profit, besides adding a thousandfold to the amenity of his summer residence.

Wood's reaping machine, driven by two horses, effectually cleared the ground of heath and furze. The area was next traversed by a horse-rake to sweep up the detritus, which made excellent fodder. Under this heath was a subsoil, mostly of very fine sand with little iron: this was turned up by a heavy subsoil plough; the furrows were perfectly and regularly made; whilst the great balls of earth which bound together the roots of the moor plants now cut down, were disintegrated so as to loosen them.

Pines were mostly sown. As much as 10 kilog. per hectare were used of seeds of *Pinus Sylvestris*, which was diversified with 12 kilog. per hectare of a mixture of *P. Sylvestris* and *P. maritimus*. The ground so sown was harrowed to ensure regular germination, which was very apparent in the second year. But birches, useful for charcoal in the seventh or eighth year, after sowing, were also extensively sown, as were alders.

Adding beauty to the landscape was a prominent object, as well as profitable, in carrying out the estate improvements. And here the success is very marked. Numerous avenues of different species of noble trees tempt alike the pedestrian and horseman; while diversified sheets of water with curious islets add variety to the scene. In such moist spots great beds of osiers grow, profitable both for the periodic crops won from them, and for the shelter they afford to numerous birds whose songs break the sylvan stillness. In the flowering season, rhododendrons, azaleas, kalmias, and other rare exotic shrubs add unique beauty to their joyous surroundings. Besides, the climate is better; the neighbouring barley or buckwheat is no longer browned in a night; and regular showers of rain can now be depended on. Country life is enjoyed, without carking cares about weather and crops.

The returns are ample on the capital expended. Altogether M. Renard has spent about £20,000 on the property; he has been offered £25,000, and refused it.

NOTES ON BRITISH ORCHIDS.

BY A. D. WEBSTER.

No. IV.

Genus 4.—*Ophrys*.—Habit and foliage of *Orchis*, but the flowers are destitute of a spur. Lip perpendicular, usually convex, and resembling more or less the body of an insect. Ovary not twisted.

Three species are usually included in this genus—*O. apifera*, *O. aranifera*, and *O. muscifera*.

O. apifera (bee *Ophrys*).—Tubers entire, roundish. Stem about a foot in height, stout, with a few lanceolate, green leaves near the base. Flowers few in number, from three to six, placed rather loosely on the stem, large and conspicuous. Sepals ovate ; petals small, linear, oblong, and somewhat downy. Lip prominent, convex, with a terminal appendage, and of a dark, velvety brown variously marked with yellowish lines and spots.

This plant is perhaps the most ornamental of the genus, and derives its popular name from the form and hairiness of the lip, which not inaptly resembles a bee. In various parts of England it is abundant, and also extends into Wales and Ireland, but has not been recorded from Scotland. Here, in Carnarvonshire, this pretty plant is found in some quantity, notably near Penmaenmawr, in the woods at Bodnant Hall, and in one station near Bangor. It is a native of mountain meadows, pastures, and even copses, and is usually found growing in a chalky or calcareous soil, though in this district it is found in the stiffest clay, usually on the limestone formation. Most of the species of *Ophrys* are difficult to cultivate, and require special care and trouble in planting, being naturally somewhat delicate. By imitating as nearly as possible the conditions under which they are found naturally, I have succeeded in flowering the present species from year to year ; but under such circumstances, I have never known it to increase.

It flowers in June or July, but I have occasionally found specimens fully developed during May.

O. aranifera (spider *Ophrys*).—Tubers ovoid. Foliage more glaucous than in *O. apifera*, larger, and not so erect. Sepals inside of a yellowish green ; petals oblong. Lip convex, without an appendage, of a dull uniform brown and marked with paler spots or parallel lines on the surface. Anther beak not hooked, the reverse of this being the case in *O. apifera*.

Although in size and general appearance greatly resembling *O. apifera*, still, as will be seen from the above description, these two species differ in many remarkable points. From the broad lip which is marked with different shades of brown, the fancied resemblance to a spider is derived. An unerring point of difference between these two species of *Ophrys* is that *O. apifera* blooms in July, whereas the present plant is usually in full flower as early as April or May.

Another spider *Ophrys* that has been raised by some botanists to a distinct species under the name of *O. arachnites*, occurs sparingly in a few English counties, notably Kent and Surrey. It is a more ornamental plant than the latter, with dark-red and blue flowers; but forms intermediate between this and *O. aranifera* are also found, which has induced some of our later botanists to rank it as a sub-species.

In northern Italy, where *O. apifera*, *O. aranifera*, and *O. arachnites* are found tolerably abundant, Mr. Moggridge has pointed out that these three, together with *O. scolopax* (an Italian species), are connected by so many and such close intermediate links that all seem but forms of one species.

Linnæus, who devoted considerable attention to this genus, was also under the belief that they were but forms, and grouped them all together under the name of *Ophrys insectifera.* Although in Britain the external appearances of these three species are somewhat similar, still the main points of difference are always recognisable. To me the continental plant under the name of *O. arachnites*, from living specimens and coloured drawings sent for my inspection, appeared quite distinct from our *O. aranifera*, and certainly warranted the specific distinction with which it was endowed.

O. muscifera (fly *Ophrys*).—Stem 9 to 15 inches in length, rather feeble, with usually three leaves near the base, and naked further up. Leaves spear-shaped or linear-oblong, much narrower than in any of the other species, and of a pale shining green faintly overlaid with a silvery hue. Flowers few, usually only three or four, placed distant on the stem, and having a striking resemblance to some kind of fly. Lip three-lobed, the side ones short and entire, the middle one largest and divided by a deep angular notch into two smaller lobes. The lip is purplish brown and very distinctly marked with a bluish naked spot on the centre.

In Britain this species is more abundant than any of the others, especially in many of the eastern and south-eastern counties of England, as well as in various parts of Wales. It has been found, but very rarely, in mid-Ireland.

Dry meadows and downs in chalky and limestone districts seem its favourite haunts, although it has been found in damp clayey woods, and alongside heathy ditches in a peaty soil.

In several parts of Anglesey this *Ophrys* is pretty abundant, and is usually found growing on the banks or mounds that had been left where peats for fuel were at one time procured, growing with unusual luxuriance, and although seldom in great numbers, it can hardly be considered as a rare plant. I have not been able to cultivate this plant in a successful manner, although fine specimens have frequently been brought me from the adjoining Island of Anglesey. It seems to prefer a raised mound or hillock on which to grow, and soil of a peaty nature freely intermixed with loam and lime.

The period of flowering varies from May to July.

Genus 5.—*Aceras.*—Resembling an *Orchis* very closely in flowers and general habit, but destitute of a spur. The two viscid discs lie close together within the rostellum. There is but one species, *A. anthropophora.*

A. anthropophora (man *Aceras*).—A stout plant from 8 to 12, and sometimes as much as 16 inches in height, with several ovate or oblong leaves near the base of the stem. Flower spike rather long when compared with the plant's height, narrow, cylindrical, and bearing numerous flowers of a dull green or pale yellow, tinged more or less with brown. Sepals and petals forming a hood. Lip long and narrow, four-lobed, of a pale yellow like the rest of the flower, and occasionally tipped with brown or dark red. It is destitute of a spur.

The popular name of man *Aceras,* or as it is usually called man *Orchis,* is certainly well bestowed on this plant, as the fancied resemblance to a hanging man in the flower of this singular orchid is very apparent, the lateral lobes of the lip representing his arms, and the middle one, which is much longer and two-cleft, his body and legs.

It is a rare plant, being principally confined to pastures and copses in the chalky soils of Kent, Norfolk, and Suffolk, but in much less quantity than a few years ago. Numbers of this orchid are imported annually by some of our nursery firms, so that it can be readily obtained by any one wishing to attempt its cultivation. Like most other inhabitants of a calcareous soil, this orchid is by no means easily managed under cultivation—at least such is my experience, for repeated attempts to grow it in anything like a satisfactory manner have been productive of but little success. The tubers, which very nearly resemble those of *Orchis mascula,* throw up stout stems, and usually flower well for the first year or two, after which the plant gradually becomes less and less, and finally disappears, probably from our Welsh climate being too damp and sunless to ripen the tubers. At Edge Hall, in Cheshire, the Rev. C. Wolley Dod tells me he has been fairly successful in its cultivation.

The flower spikes vary very considerably in size as well as density, some being long, and with the flowers loosely arranged on the stem, while others, which are, however, less abundant, are short in stature, with a dense flower spike. In colour they, however, vary but little, although specimens with more or less brown or red edging to the sepals and petals are not uncommon. It flowers in June and July.

Genus 6.—*Malaxis.*—In general stature resembling *Liparis*, but distinguished as a genus from it by the waxy pollen masses which are in two pairs, and suspended from a gland which terminates the column.

There is but one species, *M. paludosa.*

M. paludosa.—A slender plant rarely more than four inches in height, and with three or four glaucous, upright, oval-shaped leaves near the base of the stem.

The leaves are rough or slightly fringed at the extremity. Flower stem angular and smooth, unless at the base, where it is sheathed with white scales, bearing a rather loose, elongated raceme of small greenish-yellow flowers, having the lip and two of the sepals erect, the third sepal being turned downward.

Petals and sepals much reflexed.

This, perhaps the smallest and most delicate of our native orchids, is generally though not abundantly distributed throughout Britain. The minute grass-like appearance of the plant, which renders it very difficult of recognition, as well as the treacherous positions in which it delights to grow, may explain the scarcity of individual plants. Its favourite haunts are the edges of mountain lakes and swamps, where, growing on trembling sods of bog, moss, or sphagnum, it almost dares one to venture with impunity. In this county it occurs sparingly in several districts, notably in a marsh near Llanberris, and along the borders of Aber Lake, both high-lying mountain situations. This orchid is a true epiphyte, thus as it were illustrating for us the habits of that large group of epiphytal tropical orchids which are now so ardently cultivated in our gardens. Although both this species and *Liparis Lœseli* show a tendency to be epiphytal, still they will also grow as terrestrial species, just as do the Cattleyas and Dendrobes of our hothouses, which in Brazil and India are true epiphytes. The rootstock of *Malaxis* produces a small egg-shaped, solid bulb, almost above ground, or rather amongst the herbage where it grows, and with a few small descending rootlets. This tiny pseudo-bulb resembles in no small degree those of some tropical species of *Dendrobium.*

As before stated, the lip of this orchid is, unlike most others, directed upwards, which has been brought about by the spiral twisting of the ovarium. The labellum or lip is in all orchids properly directed upwards, but assumes its usual position on the lower side of the flower by the twisting of the ovarium; but in *Malaxis* the twisting has been carried so far that the flower occupies the position which it would have held if the ovarium had not been at all twisted, and which the ripe ovarium afterwards assumes by a process of gradual untwisting. This is well illustrated in Darwin's *Fertilization of Orchids.*

By transferring the plant to a damp, shady corner of the garden during the growing season, and with a good patch of sphagnum attached, it will perfect the flower, and thus give ample opportunities for investigation, but with me it has never reappeared.

Genus 7.—*Liparis.*—Approaching very closely to *Malaxis* in general habit. Sepals and petals linear, spreading. Two pairs of pollen masses waxy, attached by their summits, glands evanescent.

One species, *Liparis Lœseli*, is included in the genus.

L. Lœseli (two-leaved *Liparis*).—Bulb greenish, enveloped in soft, pale scales, and sending up in July two equal-sized, bright green, elliptic-lanceolate leaves. Stalk issuing from between the leaves to about double their height, and bearing a raceme of small lemon-coloured or yellow flowers. Sepals and petals spreading, linear. Lip ovate, longer and broader than the petals, and recurved at the point.

This interesting little plant has only been found in a few stations in England, such as spongy bogs in Cambridgeshire, and two or three of the adjoining counties. The flower stem, which is small and rather brittle, rarely exceeds six inches in height, with from five to eight yellowish-green flowers in a somewhat straggling raceme. In a young state, the flower-stem always appears as if cut or broken over, but gradually it increases in length until the flowers are perfectly developed. The leaves are bright green and smooth, almost erect, from two to three inches in length, by about half that in width, and varying in shape from narrow oblong to broadly lanceolate. Each leaf is furnished with a shorter and smaller outer sheath, or bract, which is usually lighter in colour and more fleshy. Although this plant, as stated in dealing with *Malaxis*, has a tendency to be epiphytal, still I have grown it very successfully for a number of years, in a mixture of leaf mould and brick dust; and although the original bulbs have never increased in number, yet each season they are stronger than the preceding, and throw up finer spikes of flowers—in fact, they seem perfectly established in their new abode. The bulbs have a peculiar propensity for rising out of the ground almost to their full length, but this I have always corrected by an application of fine sandy peat or leaf mould.

Genus 8.—*Corallorhiza.*—Brown or yellowish saprophytes. Sepals and petals nearly alike. Lip deflexed with two small lobes. Column short, with the anther terminal, and four globular, granular pollen masses attached horizontally.

There is but one species, *C. innata.*

C. innata (spurless *Coralroot*).—Roots numerous, branched, fleshy, and nearly white. They are also very short and densely interwoven. The whole plant seldom exceeds eight or nine inches in length, is leafless, but with the stem bearing a few tubular sheathing scales instead.

Flowers sub-racemose, drooping, of a pale-yellowish colour. Sepals ovate lanceolate, dark-green, lateral slightly deflexed. Lip oblong, white, and marked with small reddish or purple lines and spots.

Unless in a few Scotch counties, this plant is not known elsewhere in Britain. On the continent it is widely distributed, and is also recorded from Russia, Asia, and North America. It is an occupant of boggy or sandy woods, usually birch or fir, and has also been found, though in very limited quantity, in sandy seaside situations, notably a few localities in Ayrshire and Forfarshire. In Scotland this plant is, however, more plentiful than is generally supposed, there being several stations, as well as those recorded in our floras, from some of which I have received authentic specimens. On one occasion an unknown friend kindly sent me a square of peat containing the roots of this plant; but although I imitated as nearly as possible its native haunts and soil, no plants ever appeared. I am not aware that any one has successfully cultivated this rare and curious orchidaceous plant.

(To be continued.)

FRESH AIR AND RECREATION SOCIETIES.

AT the annual meeting, presided over by Lord Mount Temple, the venerable Lord Shaftesbury moved the first resolution approving of the aim of the Commons Preservation Society. In the course of his remarks he stated that young men to whom he had given allotments had underlet their plots, and had gone to towns. Mr. Story-Maskelyne stated that from his own experience as a landowner in Wiltshire, it might be well to let some land in small holdings to labourers, and to leave the commons to be turned to their more ancient uses for pasturage. Having congratulated the Society on the result of their intervention with regard to Ashdown Forest, where about 6000 acres of land had been saved for the enjoyment of the public, he referred to efforts which had been made by a Bill in Parliament to secure a public right to the free use of the Thames for the purposes of recreation.

In speaking to the second resolution, Lord Brabazon dwelt upon the fact that the necessity for the preservation of open spaces was increasing as population became more dense. Inasmuch as enclosures of commons were by the earlier Acts sanctioned only for public purposes, such as the growth of wood for the Navy and the increase of the food of the people, he thought it eminently right that common lands should be appropriated to supply that which was the great need of the day in our large centres of population.

Mr. James Bryce, M.P., stated that a corporate body was about to be organized under the Limited Liability Acts, for the purpose of acquiring and holding land and other property as an aid to the preservation of commons. It was stated at the annual meeting of the Scottish Right of Way and Recreation Society, that it has already taken steps for the repair and proper keeping of the old paths through Hawthornden and Glen Tilt, both of which were won back to the public use by the exertions of the old Right of Way Association.

THE AMERICAN BIRD MARKET.

THE *Rural New Yorker* deprecates the cruel fashion of American ladies wearing stuffed birds as ornaments on their hats, or carrying fans similarly ornamented. It is already notably depleting the groves of joyous songsters, who are at the same time insect destroyers. A single firm in New York not long since gave one order for 100,000 skins of birds of various kinds; while factories at Niagara Falls and elsewhere are using tens of thousands for the adornment of feathered fans. And thus the robin, the wren, the blue bird or the oriole, have come under the merciless law of supply and demand. Present activities, if not checked, in this way presage future extinction. Indeed, the New York bird market for this and other purposes is of large dimensions. So many as 60,000 canaries are sold there every year, besides 3000 parrots, 1000 mocking-birds, 3000 to 4000 goldfinches, as well as others of the multitudinous bird varieties. Amongst regular breeders and dealers so much as £21,000 is annually interchanged for canaries, and fully £42,500 for other birds.

Mr. Sennet, of the New York Museum of Natural History, states, in a recent issue of *Forest and Stream*, "that on entering a market about midday, towards the close of March, in Norfolk, Va., he found, besides the legitimate game birds, no fewer than over thirty of the rarer species exhibited on the sale booths, and in very poor condition—in truth, reduced to skin and bone.

"In point of numbers the robin was by far the most numerous of those not considered game birds. Next to the robin was the field lark, then cherry birds or cedar waxwings and blackbirds (including the grackles and cowbirds). Woodpeckers were upon almost every string and bench. The sparrows were perhaps the most prominent of the remaining birds in the list. Some twelve or fifteen booths or stands had these birds for sale, along with limited quantities of every conceivable animal and vegetable that the fields, woods, or water could contribute. While some stalls had three or four hundred small birds, others would have but a dozen or two. I regretted that I could not have seen the market before the sale of the day began, as undoubtedly most of the stuff had been disposed of before I arrived upon the scene. Nearly all the vendors were coloured people, and doubtless most of the birds were captured by the same class. A glance at the list will show an utter disregard of the Game Laws, if indeed such laws exist. Several purchases were made in my presence, and the vendors laid great stress upon the good qualities of the waxwings, sparrows, and blackbirds as being superior to the shore birds and robins, which latter are more commonly and abundantly offered for sale.

"At one stand I was amused to find a crow and a screech-owl. To the question, 'Are owls good?' the darkey replied, 'Yes, sah, all birds is good to eat;' and when the question was asked, 'They don't eat crow, do they?' the answer came, 'Course dey do. Crows eat corn, don't dey? Den why isn't dey good?'"

As almost all the birds of the Northern States migrate south in communities or flocks, such fell destruction as noticed above means the wholesale annihilation of needed friends and useful allies throughout the Union. Can we wonder, then, that the institution of strict protective legislation finds advocates?

PINE BLIGHT IN FRANCE.

THE appearance of the *Æcidium* or *Peridermium Pini var Corticola* upon the trees of *Pinus Sylvestris* of the forest of St. Germain in May and June, threatening their destruction, has caused no small commotion in French forestal circles. Visits have been made to the infected pines by the highest cryptogamic authorities, who do not think the fungus spores carry direct contamination. While the young pines are therefore to be spared meanwhile, the elder ones attacked by the *Æcidium* are to be cut down without delay, so as to counteract at the same time the ravages of the insect which is found to accompany this noxious fungus. Indeed, the insect and fungus both appear on the spotted and blistered pine in May and June, most decidedly in the fifth year of growth at the whorl nearest the ground, and their ravages are felt by trees of all ages and varied species. Sulphur and coal-tar have both been tried as remedies, but with no decided results. The forest guard at present can only combat this wide-spread pest by lopping off the parts of the pine where disease begins to show itself.

THE MAMMOTH SEQUOIA OF CALIFORNIA A SWAMP TREE.—Profiting by this one of the most interesting lessons of his visit to California, Thomas Meehan brought three strong plants with him and set them in a swamp. They have had two winters and one summer, the past winter being notably severe, but the plants are now sound and flourishing.

WASTE IN TIMBER-FELLING.

BY J. CHARLES KING, BULSTRODE, SLOUGH.

(PLATE II.)

CAN trees grown for sale be made a commercial economy in British woods? This question was prompted by a recent survey of woods during bark-peeling. As knowledge is often epitomized by a symbol, and demonstrated by a picture, the accompanying rough sketches of oaks growing from "stubs" will supply answers to the questions asked. The answers will be both "Yes" and "No." Fig. 1 is of a part of an oak growing on a "stub" or "stool" or "runt," as it is variously termed in different parts of these islands. Fig. 2 shows two oaks growing from a "stub;" all are what are technically known to wood-wards as "thirds," *i.e.* the tree-growths left on stubs after two previous thinnings out, the first one at the tenth year; the other, the second, at the twentieth year; and third, at the thirtieth year, now illustrated by Fig. 1 and Fig. 2. Fig. 1 gives the answer "No!" most emphatically. Fig. 2. indicates "Yes!" as plainly.

The sketches are of trees grown in the home counties, with the difference, that soil and position were much in favour of Fig. 1. To say that one of the trees had been properly cut, and the other had not, when the stubs were left for future tree-growth, would be to give an answer which any tyro might venture to make; but the question is not practically answered. Again, Why was it not properly cut? A pictorial demonstration (Fig. 3) will show how Fig. 1 doubtless was cut thirty years previously, when the tree was felled. The dotted line AB will indicate how this should have been cut, close to the ground; and then it would have produced Fig. 2, if properly trimmed out at the first and second underwood "fall," instead of Fig. 1, fit only for firewood. The tree which was felled leaving the stub (Fig. 3) was deprived of its butt containing $2\frac{1}{2}$ cubic feet of the best timber, value 5s. at the lowest estimate. By this wasteful method of cutting, the yearly loss on an extensive forest would be enormous; and still more so, where the old plan of axe-felling is adhered to by the wood-wards. Fig. 4 illustrates this waste of valuable timber, often to enable the wood-wards to make more chips as a perquisite for firewood; the stub being made almost worthless, also, often comes within the category. The chopped end of a tree is not reckoned when the timber is sold. This is another loss. Now estimate the value of one or two trees from stub-growth after thirty years, as shown by Fig. 2, at 10s. each, and compare with the firewood, Fig. 1, worth 10d., and finally survey the wreck of what might have been an ornamental and remunerative wood, and the answer why some woods do not pay becomes obvious.

Fig. 1

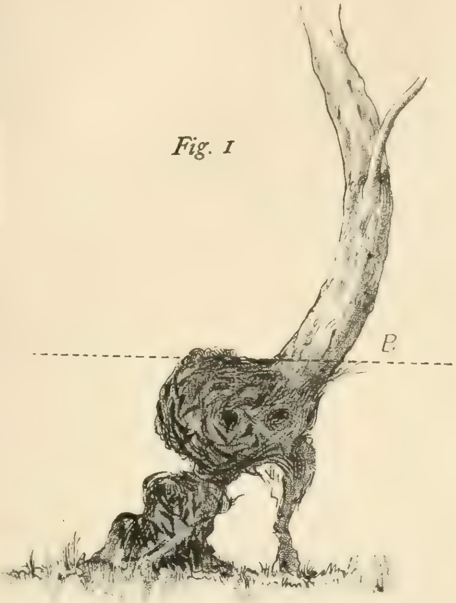


Fig. 2

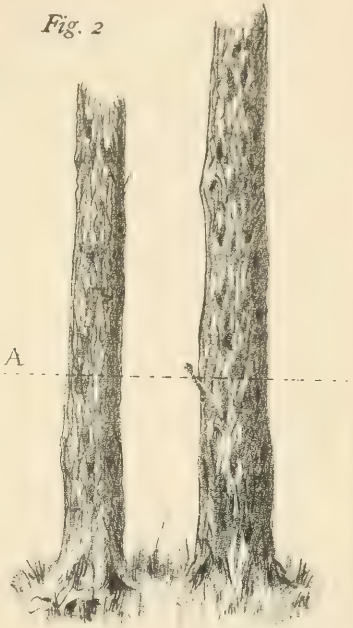


Fig. 3

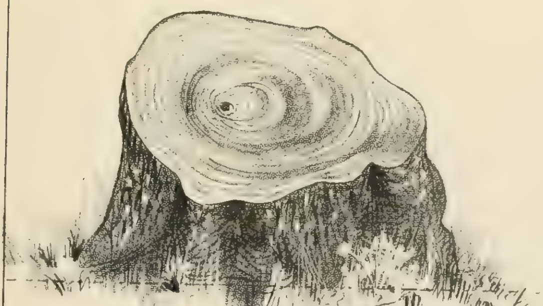
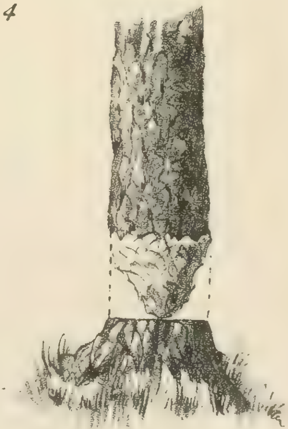


Fig. 4



HOW LIGHTNING STRIKES TREES.

BY C. W. HOPE.

I DO not remember seeing the article in February's *Forestry* reprinted in the *Indian Forester*, and I do not see *Forestry* itself, so I do not know whether any attempt was made in that article to account for the various phenomena mentioned.

Arago in his *Meteorology* (I write from recollection after 25 to 30 years) accounts for a tree being struck by the fact that owing to its being full of sap it is a good conductor, and he says that the splintering is caused by the explosive force of the steam into which the sap is suddenly converted.

I do not think that Col. Pearson's theory fits in with the facts I have observed. In 1871, I was at Simla during the rains, living in a house close to the church, and a deodar of about 2 feet diameter (perhaps the largest then on the Simla ridge) just behind the house was struck. The upper half of the tree, including most of the branches, was knocked clean off, and the lower half was cleft widely down to the ground, the bark being peeled off in large sheets. There was not much splintering in this case, if I recollect rightly. In the same month, June I think, a small deodar was struck in Simla, and converted into matches, the bark being blown into fragments in all directions and to some distance. This could hardly have been caused directly by the lightning, which, the wet tree being a good conductor, must have passed into the ground; but Arago's theory would account for what happened, always supposing it possible that the sap of the tree could be so instantaneously boiled.

Last year there was a notable case, when a large deodar near the Municipal Hall, Mussoorie, was smashed to pieces. In all these cases, which happened in wet weather, the trees were quite moist, but yet did not escape.

Colonel Pearson thinks that a tree when absolutely dry is nearly a non-conductor, and his impression is that it is then shivered to atoms. I presume he means when the bark is absolutely dry. But the fact of the tree being struck at all shows that it is a conductor, and this is mainly owing to the sap it contains. Is there any instance of a dead tree having been struck? I have heard of lightning having been seen in Mussoorie to fly off in sparks from a strip of galvanized iron, used as the lightning-conductor of an iron-roofed house, to a tree close by, to burn the leaves.—*Indian Forester* for June.

LABOUR-SAVING HELPS.

AMONGST many ingenious helps for labour-saving indicated by Mr. Jenkins, of Ohio, at the Nurserymen's Convention meeting in Chicago, the following may be suggestive:—

Adjustable Hinged Sash.—Finding where we had uncovered portions of the greenhouses for the benefit of summer showers, that the plants flourished more than with all our careful watering, we hinged the sash from about the centre of each, to short rods attached to the benches, by which means we readily and quickly raise each sash to a perpendicular position, drop and lock it in a cross-piece over the centre of each bed; thus readily throwing them open for the rains.

Hinged Cranes.—We have covered a number of beds with muslin, to shade the young plants, and avoid too rapid evaporation. Two cranes are hinged at the ends of each bed, the arms strongly braced, corresponding in length with the width of the muslin covering. The latter is fastened all along the back edges of the bed, and in front to a wire stretched taut between the two cranes. The cranes and muslin attached can be raised to a perpendicular or thrown entirely over, and a bed 50 feet long is uncovered in a moment of time.

Transplanting Boxes.—Starting many cuttings in the greenhouses which we find advantageous to transplant in rows afterward, giving them more room, we use, instead of pots, L-shaped boxes, easily made by nailing together two thin boards, one 4 to 6 inches wide, forming the side, and one 1 or 3 inches wide for the bottom; 3 or 4 feet long—the length corresponding to the width of the border in which they are placed. These, ranged together lengthways, form a series of boxes, the back of one box making a side for the one preceding it. In these, which economize every inch of space under the glass, rows of twenty or more vines or plants are grown, until 4 or 5 inches high, when, after being properly hardened off by removing the glass, the entire row is lifted in the box, without destroying roots or soil, and turned out into the open furrows or trench. They are thus transplanted as quickly as a single vine from a pot, and positively without loss or any apparent checking of growth. The boxes, after being dipped in hot lime water, appear quite free from fungus, and as healthful to the plants as pots.

THE ENTOMOLOGIST.

GALLS IN BEDFORDSHIRE.

OBSERVANT residents in or visitors to the country will have noticed that the oak trees are this year more than usually burdened with galls of various kinds. Especially one kind of gall, which resembles a small potato and grows at the ends and sides of the twigs where leaf-buds ought to have developed, may be seen in great numbers. A tree near Cardington looks as if it were laden with fruit, so numerous are these injurious excrescences. The life-history of the flies that produce these galls is—like that of many of their kindred—exceedingly curious. It is only recently that entomologists have correctly learnt what this life-history is; but they now know that the insect in question is one of those that exist in two distinct forms, producing two distinct kinds of gall, the one form of fly and gall alternating with the other. In the late summer, the little gall-fly—*Teras terminalis*—emerges from the potato-like galls above mentioned, makes its way down to the roots of the tree, and there lays in the bark of the roots eggs that produce small reddish-green galls. In the winter—particularly if the weather be open—from these galls there emerges another gall-fly—*Biorhyza aptera*—unlike its progenitor, and this climbs to the branches, and lays eggs in the already formed leaf-buds. One entomologist certifies that in the course of eighty-seven consecutive hours, he observed a single individual gall-fly of this species lay 582 eggs in two leaf-buds. As soon as the buds begin to swell, early in May, those that have been made the receptacles for these eggs, instead of developing into twigs, grow into potato-like galls, each containing a number of grubs which in July issue in the shape of specimens of the *Teras terminalis*, and proceed, as stated above, to attack the root. When a tree is infested so much as some we have this year seen, there can be but little new wood produced during the season, and the general health of the tree must be seriously impaired for the time at least.—*Bedfordshire Times and Independent.*

THE SIREX GIGAS.—From subsequent communications from Mr. Robertson, forester at Novar, Ross-shire, it appears that the *Sirex Gigas* is the smaller insect of his former communication. Its boring galleries in the pine bark and onwards, show how much damage this small pest may effect on noble forests.

Reviews of Books.

Report on Forest Administration in the Chota Nagpore Division of Bengal. By W. Schlich, Ph.D., Inspector-General of Forests to the Government of India. With one Map. Calcutta, 1885.

The Chota Nagpore Division, subdivided into four districts and a number of tributary states, consists of a series of plateaux, one of which is 4500 square miles, and another 600 square miles. Some of the hills intersecting these deeply-serrated districts—for one of them is called "the land of seven hundred hills"—are high, one attaining 3600 feet. While the tributary states have only an average density of population of 42 per square mile, and have large forest tracts, not requiring any further interference than that exercised by the Commissioner in his annual tours of inspection, the forest needs of the population in the British districts, ranging from 121 to 255 per square mile, demand urgent attention. Now the percentage of the Government reserved forests in the total area of public lands is only 3·6 per cent., and it is apparently impossible to raise this to a higher ratio than 4 per cent. Again, the principal private forests range from 10·4 to 6·4 per cent. If these could be preserved without forcing Government to buy them, the normal limit of safety desirable, viz. 10 per cent. of forest to the total area, might be attained. But the Inspector-General thinks it is necessary for Government to purchase at least 1500 square miles for forest purposes. Half measures will no longer suffice. The zamindars are rapidly consuming the interest and capital represented by their forests; and forest produce must soon rise in price throughout the division.

Sport, Travel, and Adventure in Newfoundland and the West Indies. By Captain W. R. Kennedy, R.N. With Illustrations. Edinburgh: W. Blackwood & Sons. 1885.

From 1879 to 1882 inclusive, H.M.S. *Druid* was engaged cruising on the North American and West India stations; and this well-written and entertaining volume gives the varied experiences of her commander, whether as magistrate in the solitary bays and arms of Newfoundland, where field sports mingled with legal duties, or as guardian of the British interests at Haiti, or the Mosquito coast. This fresh honest narrative of a seaman contains interesting forestal items. Newfoundland is shown to be a land of a forbidding coastline, but having splendid inland pastoral and wooded plains, the latter of which promise to be speedily destroyed by forest fires. The question of droughts in Jamaica, now far more prevalent than formerly, is referred to the indiscriminate cutting down of its valuable timber trees by negroes for land, who then leave the patches they had previously cultivated to merge into jungle. In this way thousands of acres are destroyed, and the probability of a serious diminution of rainfall hurried on. The timber trade of Belize, British Honduras, is looking up; in fact, the supply of mahogany and logwood appears to be inexhaustible, though the mahogany cutters have now to go far into the forest, and to spend much in transporting their heavy logs to the water-portage.

The Great Auk or Garefowl (Alca impennis, *Linn.*): *Its History, Archæology, and Remains.* By SYMINGTON GRIEVE, Edinburgh. London: Thomas C. Jack. 1885.

THIS splendid quarto, with its quaint representation of the lost bird of our northern seas, and beautifully coloured plates of eggs, specimens of which were lately sold for more than £100 each, belongs to a type of library treasures which used to be honoured by the best place on the shelves, but are now being displaced by the more ephemeral productions called into demand by Mudie's and similar circulating libraries. Ornithology, according to its most enthusiastic votaries, is shamefully neglected, and this plaint may be true regarding living birds. But the Garefowl, some 3 feet high or so, with white specks like the optician's aids to vision below its eyes, contrasting as strangely with the black head, razor bill, and white downy breast, disappears from the list of living species some time about 1844; and at length it has received a literary monument of a far more permanent character than many of the stone ones erected to humble poets and scientists whom we allowed to starve while living. We must refer our readers to the pages of this most interesting and exhaustive monograph for all that can be said about the Great Auk.

La Forêt for July contains a plea by Marcel Tailis for the removal of the Forest School from Nancy to Paris, where the course of study of the Agronomic Institute, the training-school of young French agriculturists, might form the preliminary course to be taken by the Government forest students.

Congrès International de Botanique et d'Horticulture d'Anvers: Rapports Preliminaires 1^{er} *and* 2^{nd} *Fascicules.*

These the publications of the Botanical and Horticultural Congress, held under the patronage of H.M. Leopold II., from the 1st to the 10th of August, contain papers of permanent value by some of the ablest European botanists on some of the questions of the programme which are to be submitted to the botanists assembled in conference this month. The culture of edible mushrooms, the place of botany and agriculture in secondary education, the organization of botanical laboratories, how far the study of cryptogams should form a part of a course on agriculture or sylviculture, the best methods of teaching theoretical and practical botany in schools of horticulture and agriculture, including the study of vegetable pathology in such institutions, insect pests, as well as such contrasted subjects as the best way to treat in monographs genera containing numerous species, and sewage waters, are the subjects of one or more elaborate essays by experts. The programmes of botanical teaching given in the second number, whether in primary schools or in the special State institutions for technical training in agriculture, horticulture, and sylviculture, possess much present interest.

Woods and Forests Department: Annual Catalogue of Trees for Free Distribution, Season 1885–86 : *With Description of Trees, Soils, and Situations suitable for each kind, Directions for Planting, and Conditions of Issue,* etc. Adelaide : E. Spiller, Government Printer. 1885.

This, the last literary issue by the South Australian Government, is for distribution among the participants of its free grants of young trees for planting to corporations, district councils, farmers, and others, arising out of the annual vote of £300 passed by the Colonial Parliament during the current year. There are consequently about 423,420 trees, embracing thirty different kinds for distribution. The Government holds that while it cannot compel a man to plant, it may persuade him to do so.

Revue des Eaux et Forêts for June and July contains capital papers on the French pine blight, as well as discussions on the treatment of fir forests and of resins.

From the July number of Meehan's *American Gardener's Monthly,* we learn that the question of the disadvantages of our present Exhibition prize system has cropped up in connection with the New Orleans Exhibition, now closed till November.

OBITUARY.

DR. FRANKLIN B. HOUGH, our frequent and valued contributor, appeared a remarkably healthy man; while more than seventy publications to which his name is attached, on botany, forestry, topography, law, and statistics, are the sufficient monument of his literary labours; yet his first illness was his last. An attack of pneumonia seized him while in Albany watching over the progress of the New York State Forestry Bill, the successful inception of which resulted as the fruit of his labours. He was able to throw off this sufficiently to return to Lowville, long his village home; a complication of maladies attacked his system, and he died there on the 11th June last, in the 63rd year of his age.

Though educated as a physician, Dr. Franklin Hough never entered into active practice for any lengthened period. So early as 1847 he published a catalogue of plants of Lewis county, which was the forerunner of an extensive series of researches in forestry, meteorology, and the collection of statistics. He was superintendent of the New York State Census in 1855, and again in 1865. But his fame will mainly rest on his report on the methods of the German and other Continental Forestry Schools, visited by Dr. Hough in accordance with a special Act of Congress when chief of the Forestry Division of the Bureau of Agriculture. And we only add that in the last issued report of this Department, there are no fewer than five separate papers by Dr. Hough, on subjects varying from the woods best suited for railway ties, to the cultivation of the maple for its sugar in North America.

FUNGOID DISEASE.—At the July meeting of the scientific committee of the Royal Horticultural Society of London, a communication from Wellington, New Zealand, was read, regarding the destruction of fruit trees by the mycelium of a ground fungus. The effects extend in a most singular fashion, travelling half-way across a garden or orchard from one side only, at others extending in all directions. The affection shows itself first at the juncture of the root and stem. The bark becomes absolutely rotten when permeated by the mycelium, and emits a nauseous odour. Plum trees usually show but little mycelium as compared with apples, but the trunk is more obviously affected, and exudes gum freely.

LEGAL.

GOVERNMENT FORESHORE RIGHTS.

QUEEN'S BENCH DIVISION.—Tuesday, June 9.

(Divisional Court, before Lord Coleridge and Mr. Baron Pollock.)

The Attorney-General, on behalf of Her Majesty, *v.* Reeve.

THIS was an information by Sir Henry James, Attorney-General, on behalf of Her Majesty, against a gentleman in Norfolk, to establish the title of the Crown to some land lately added by accretion to the shore at Lowestoft, in the county of Suffolk, and it was the revival—for the first time in the High Court—of a very ancient proceeding—that of an information in the Exchequer—to establish a right of the Crown. Under the Judicature Act, the jurisdiction of the Court of Exchequer was vested in this Court, and no application was made in the proceedings of the Court as a Crown Court, which therefore stands as it was altered by the Crown Suits Act, 1865; and this was the first case of the kind that had arisen since that Act. It was, therefore, at once a proceeding extremely ancient, though one rarely heard of in modern times, and it was the first case arising out of the acquisition of land from the sea by accretion since a case of the late Lord Yarborough's, which was litigated sixty years ago, and in which the House of Lords affirmed the law as laid down by Bracton and Lord Hale and all other old authorities—that land gained by alluvion, or accretion from the sea, belonged to the Crown, unless the accretion had been so slow and gradual as to be imperceptible, as it was held to be in that case.

The effect of a pier and works by the Norfolk and Great Eastern Railway Companies on land granted by the Commissioners of Woods and Forests at Lowestoft, on the coast of Suffolk, has been to cause the sea to recede on the north side of the north pier for a certain distance, so that on that side the sea at ordinary high tides does not now advance farther landwards than the extremity of the north pier, leaving the original foreshore and part of what was originally bed of the sea uncovered. Such recession of the sea the Crown alleged to have taken place from time to time perceptibly in its progress, and was due, as the Crown alleged, solely to the existence of the pier and other works, the line of high-water mark southward of the harbour remaining unaffected. Even if this recession of the sea had been imperceptible in its progress, which on the part of the Crown was denied, it was alleged that, at any rate, the bounds of the former line of ordinary high-water mark were known, and the limits of the land left uncovered by such recession were distinctly ascertained and were capable of being ascertained. The defendant claims to be lord of the manor of Lowestoft, and had recently, for the first time, set up a claim to some portion of the foreshore on the north and south sides of the piers and harbours, as being parcel of the manor; but the Crown alleged that such claim was unfounded, and that the defendant was not entitled to any part of the foreshore of the sea at Lowestoft. He also claims that, even if he is not entitled to the foreshore generally, he is entitled to that portion of the original foreshore and bed of the sea on the north side of the north pier which is now left uncovered at ordinary high tides, owing to the recession of the sea consequent on the construction of the pier and harbour works; but this claim also was disputed by the Crown, and this information was filed on the Equity side of the Court to try the question and uphold the title of the Crown to the land in question; that is, land acquired by accretion from the sea, which was alleged on the part of the Crown not to have been so gradual as to be imperceptible, but to have been from time to time perceptible and attributable to the effect of the pier and harbour works. On the part of the defendant, the lord of the manor, the title of the Crown was admitted to the foreshore, but the land in question was claimed as acquired by gradual and imperceptible accretion to the soil of his manor from the sea, and also as caused by the pier and harbour works created under grants derived from the Crown. The issues thus raised came on to be tried before a Court constituted of two judges, without a jury, the information being tried on the equity side of the Court, and all cases on that side having been so tried in ancient times, and, as already mentioned, the ancient practice of the Court of Exchequer in Crown cases still subsisting, save so far as altered by the Crown Suits Act, and no change having taken place in this respect.

The witnesses, in cross-examination, stated that the sea had receded rapidly—though perceptibly—of late years, the beach gradually increasing on the north side of the works, not the south side. They were asked whether the shore had not increased since 1850 at the rate of 14 feet per annum, but could not say at what rate. They stated that since 1845, when the north pier was begun, the line of ordinary high-water mark began to recede and the beach to advance, and that this advance of the beach could be plainly perceived from time to time as it went on. Then the depositions of witnesses on behalf of the defendant were read, to the effect that the accretion was imperceptible and caused by the harbour works. It had been going on ever since 1830. At one part it was stated that the accretion was as much as 1200 feet, perhaps it averaged 30 feet in a year. It might be perceptible perhaps in a month. Since 1878 the accretion had extended perhaps 300 feet. It was not always at the same rate; it depended on the winds and waves. It had been much more rapid in recent years. The town is on a cliff, and it must, they said, have been several hundreds of years since the sea was up to the cliff.

Lord Coleridge observed that the title of the Crown being admitted to the foreshore, and the question being as to the title to the land acquired by accretion, that seemed to resolve itself into this: Whether it was by gradual and imperceptible accretion or by perceptible accretion, the title of the Crown being alleged to attach in the latter case, the title of the claimant in the former. It was apparent that in this case the accretion had arisen in part from artificial causes, not causes purely natural—that is, from the harbour works; but would that of itself make any material difference as to the law of the case?

The case was adjourned.

THE POLLUTION OF THE RIVER TAY.

Sir Robert Drummond Moncrieffe *v.* The Lord Provost, Magistrates, and Council of Perth.

THIS case, whose inception was noted in our December number (vol. x. p. 159), was decided by Lord Trayner in the Outer House of the Court of Session, Edinburgh, on July 9th. As it traverses points of general interest, we give the judgment at some length.

Lord Trayner said that he found it established as matters of fact, (1) that the water of the river Tay, as it flows past the pursuer's property, is polluted by the discharge of the sewage of Perth to the extent which renders it unfit for primary purposes; and (2) that the same part has been polluted by the same causes for a period of more than forty years, to the extent of rendering the water unfit for primary purposes. The defenders presented a body of evidence on the subject of the use of the water for primary purposes which was irresistible. It amounted to this, that more than forty years ago, and since, no one used the water at Friarton for primary purposes; that young people were warned against it; that water for domestic purposes was got at private or public wells, and never from the river; that sailors and others employed in or near the harbour and banks of the river went elsewhere for water; and that ships leaving the harbour did not fill their water-casks until they had got half a mile or farther down the river below Friarton. The pursuer met this body of evidence by saying that within the last forty years the water had been drunk and otherwise used by the persons living on the island. That might be taken as true, but it did not prove that the water was fit for the purposes to which it was applied. Indeed, the tenant of the island said that although his grieve and the people on the island drank the Tay water at present, he did not think it was fit for use. Nor did it help the pursuer that the water-supply of Perth and of the General Prison were drawn from the river. These supplies were filtered before being used, and so long as the filtration was attended to, no bad results followed. Whether there had been a material increase in the pollution of the river since 1868 was a question of difficulty on the proof. He might add that, in his opinion, the chief cause of the pollution in the river, and the worst kind of pollution, came from the General Prison by a lade or channel which was not the defenders'. As regarded the salmon fishings, the pursuer had proved that, whereas in 1868 they were let at a rent of £380, the rent in 1885 was only £50, and he attributed the fall in rent and consequent loss to himself entirely to the increased pollution of the river. The evidence on that subject was altogether opinion, and on a careful consideration of it his Lordship was of opinion that the pursuer had failed to prove that the operations of the defenders had done the injury of which the pursuer complained. It appeared to his Lordship, however, that the causes assigned by the defenders' witnesses (and admitted by many of the pursuer's witnesses) were sufficient in themselves to account for the injury of which the pursuer complained. His Lordship accordingly sustained the sixth and seventh pleas in law for the defenders, and assoilzied them with expenses.

Counsel for Pursuer—Mr. Mackay and Mr. Darling. Agents—Lindsay, Howe, & Co., W.S.

Counsel for Defenders—Mr. Pearson and Mr. Dickson. Agents—Irons, Roberts, & Lewis, S.S.C.

ALLEGED BREACH OF IRISH TIMBER CONTRACT.

S. Wilson *v.* Col. R. A. D. Hepenstall.

IN the Court of Queen's Bench, Dublin, on June 20th, before Chief Justice Morris and a special jury, Samuel Wilson *v.* Colonel Ralph Anthony Dopping Hepenstall was an action to recover damages for an alleged breach of contract, by which the defendant had agreed to sell to the plaintiff 250 tons of timber, at the rate of 9s. per ton, as agreed on in February 1884. The plaintiff, a timber merchant in Athlone, sent his woodcutters to the defendant's estate at Derrycasser, Co. Longford, and when they got about 60 or 70 tons which had been blown down by a storm, they asked that the remainder should be pointed out to them. Defendant said that was all he had, that he only intended to sell the timber that had been blown down; whereupon the plaintiff refused to take any of the timber unless the terms of the contract were fulfilled. Before the contract was broken, the plaintiff, at the request of the defendant, had paid defendant's brother £20 on account of the price of the timber, and also incurred £7 or £8 expenses. He now sought to recover his outlay under both these heads, and also the profit which he might reasonably have expected from the transaction had the defendant carried it out.

The jury found for the plaintiff, £45 damages.

LETTERS TO THE EDITOR.

BRITISH AND FOREIGN FORESTRY SYSTEMS.

COPENHAGEN.

SIR,—In your issue of June, a letter appeared, signed "Thunderbolt," containing some sentiments with which I fully agree, and which ought to be acted upon by all foresters and forest-lovers of Great Britain. It is quite correct that no German, French, or foreign system of forestry can in its entireness *be practical in Britain.* The conditions of the island clime, with the vicinity of the great warm southern currents, the ofttimes very peculiar form of the hills and high lands and the different formations, the character and customs of the population, and the great facility for transport,—all these factors are so different from those which rule the administration of the forests on the Continent, that it must be evident to the merest tyro that it will be necessary to form a peculiar scheme for the re-afforesting of the British isles; and all the information we can obtain in as brief and business-like a manner as possible will be most valuable to those whose work it may be to form the above-named scheme. Only to mention one point, I will beg to notice that the careful observations of the yearly growth of each kind of tree in various kinds of forest and under varying conditions, as well as the form-quotient (*Formzahl*), whereby the actual amount of wood or timber per acre is calculated in a standing forest, as well as giving a clue to the looked-for result of young forests, are bound to be subject to considerable alterations. The tree which in Germany culminates in its 60th year, may in Great Britain culminate in its 30th year, and thereby alter the whole plan for its cultivation. The habit of obtaining the most of English timber from abroad is another difficulty. In regard to "Thunderbolt's" proposal to form an association of foresters, I sincerely trust that it may prosper; and if I, though at present living abroad, can be of any service to this forest "Foresters' Association," I should be happy to assist in any way possible to yours obediently,

D. HOWITZ, *Forest Conservator.*

FOREST WORK FOR THE MONTH.

ENGLAND.

PLANTATIONS.—Clear, drain, and fence all land intended to be planted during the ensuing season. Dig pits where the soil is ungenial, cast the soil out of them, and leave them exposed to the mellowing influence of the weather till the planting season arrives. Let the holes dug be big; those intended for oaks or other valuable hardwood trees ought not to be less than 18 inches diameter by 15 inches deep, with the "pan" or subsoil at the bottom broken up with a foot-pick, so as to allow surface water freely to percolate down into the subsoil. See that rank vegetation does not impede the growth of young trees.

PRUNING.—Forest trees as well as ornamental trees and shrubs, which have finished their summer's growth, may now be pruned so too may hedges. Also keep all young hedges clear of rank weeds and grass.

NURSERY.—Keep the digging-fork, hoe, and rake in constant operation. About the latter end of the month, transplant evergreens, choosing cloudy, moist weather for the operation; also propagate by layering such shrubs as are stooled out, and continue budding ornamental trees. Look over ornamental trees which were transplanted during last spring, and see that all the ties, stakes, or other supports are in good order, and not cutting or chafing the bark, re-tying where necessary to withstand the autumn gales.

W. R.

SCOTLAND.

PEELING larch or barking wood for seats and fancy work, which was not overtaken last month, should be finished, as the bark now begins to set, and thereafter peeling is rendered impracticable except by an expensive process.

Dead and broken branches, and especially dry withered ones, should be removed from amongst the green foliage of the tree, and the wounds dressed so as to be as near the colour of the natural bark as possible. As a rule, for this purpose, painting with Archangel tar, and thereafter rubbing over with a sandy turf, answers well; and is both cheap, easily applied, and effective. The policies at this season, which are often in charge of the forester, require constant attention. See that no branches are hanging too low for the carriage on the drives, which should always be 16 feet clear, or the head on the walks, which should be 8 feet clear.

The summer growth of the hedges should now be pruned off, and the whole surface rendered eye-sweet. When choice can be had, thorn hedges should be pruned in dry weather, and beech in wet or dull weather. The latter is so comparatively tender that it withers less or more if pruned in very hot, dry weather, which spoils the appearance very much for a time. All whin hedge-pruning should be finished to enable them to get clothed before winter sets in, otherwise they are apt to lose their vitality during frost.

The sickle and other instruments for weed destruction should be freely used, especially amongst young trees of less than 3 feet high. Nettles, brackens, thistles, docks, ragweed, queen of the meadow, wild rasp, rank grasses of all sorts, and anything that tends to choke or obstruct the growth of the plant, should be removed. Light air, and freedom for the full and free development of every member, is what every tree demands, and is entitled to have as far as possible.

The ravages of insects should be duly watched, but indeed little more can be done beyond merely ascertaining the fact and looking on. Who can cope with the caterpillar spread over a forest, where the tree-tops mingle with the clouds and every leaf animate with insect life ? In the nursery or young plantation, where the trees are within reach of the hand, the caterpillar may and ought to be summarily dealt with by simply crushing it with the hand, glove on or glove off, as sentiment and feeling dictate. The pine beetle may be dealt with in a corresponding manner; the shoots which show the usual unmistakeable signs of attack may simply be cut, or broken off, put into a sheet or basket, and carried to a convenient place to be calcined with vitriol or burned with fire. Squirrels should also be strictly watched, not that they peel the trees so much now as earlier in the season. At this time of year they live principally upon the cones, but they should be killed at any season whensoever and wheresoever found.

Fires should be carefully guarded against, since here prevention is everything, cure next to nothing. When a fire does take place, two things should be done, and which often prove of much practical value, namely, men keeping abreast with the fire, and with long switches preventing it from spreading. The other is to go in the same direction the fire is going, light a fire at a drain or burn-side, or open part of the plantation, or any place where it can be directed to burn backwards towards the approaching fire. In this way much valuable plantation can often be saved. This is often a dry and warm month, and therefore large trees recently planted are apt to perish for want of water. A thorough good watering once or twice a week is sufficient to preserve life, and should not be neglected, even though the water requires to be carted a long distance. For want of one or two liberal waterings, thousands of trees usually perish during this and next month which might be preserved at comparatively small cost.

Fences of all kinds should be kept in good order, so as by no means to allow sheep, cattle, or horses to go amongst young trees till they are high enough to be out of their reach. Trees, indeed, may never be considered as safe at any age when exposed to horses, which are a great enemy to them at any stage of growth.

Peeled oak and larch may now be carted to its destination, whether that be the sawmill, woodyard, or elsewhere; but in doing so, every care should be taken not to injure young plants or underwood of any kind.

Any ligatures that have not been slackened should be done at once, and special outlook made that no wires, nails, staples, or other iron be attached to growing trees in any shape or form.

C. Y. Michie.

Cullen House.

WALES.

It is the custom in this neighbourhood to pay extra wages to all labourers—at whatever work employed—for a month during harvest. As soon as the corn crops are ready to cut, we will relieve as many men as can be spared to assist in the work. Under the circumstances, the principal operations during the harvest season will be fencing, cleaning, etc. Continue the fencing, cleaning, and draining of ground for planting during the coming season.

Young hedges will still require attention in the way of cleaning and loosening of the soil. Where not already done, no time should be lost in relieving young plants by clearing away all ferns, whins, and other rough herbages. Cut all thistles and nettles along the sides of drives and margins of plantations before they ripen their seeds. Also mow and clear up all shooting drives and rides.

Continue to paint or tar iron or wood gates and fencing of all sorts, as well as all other outdoor structures, such as bridges, sheds, etc.

The present is a good time to repair the embankments of rivers and watercourses. Such work is done to best advantage when the water is low and warm.

Turn compost heaps, and continue to keep the hoes going in the nursery grounds during fine weather. Weeds will also be troublesome on drives and walks, which should be kept clean.

Lewis Bayne.

Kinmel Park, Abergele.

CHIPS.

Pasadena Flower Record.—The following record of the varieties of wild-flowers gathered each month for the year 1884 by the children of Mr. Thomas Nelmes, is of interest as a matter of curiosity as well as for its botanical value :—

In January, 65 varieties were gathered ; in February, 68 ; March, 70 ; April, 73 ; May, 87 ; June, 70 ; July, 60 ; August, 54 ; September, 50 ; October, 45 ; November, 48 ; December, 56.

Lanarkshire Rents.—Land rents in upland parishes vary from half-a-crown to five shillings an acre, while in other places agricultural rents reach to £6 an acre. Near towns value increases. In the Parliamentary return the owner of one acre gives its value at £132, and the Airdrie Gas Company hold the same amount valued at £700 a year. In Glasgow an acre yields an income of £6923, 10s. a year. From three acres there Sir James Campbell of Stracathro has £12,912, 5s. of yearly income ; and other proprietors of a single acre have from £1000 to £3000 of yearly income.

New Poplars and Willows.—Professor J. L. Budd describes in the *Iowa Homestead* two new varieties he has been distributing amongst settlers in the prairie.

The Norway willow is known to botanists as *Salix fragilis.* Its most common name in North-east Europe is "Red Willow," this name being derived from the salmon-red colour of its wood. It is found on the sides of the military roads in Central Russia as landmarks in winter over the steppes, and larger plantations are common, in the thinning and clearing out of which the bark is used for tanning the famous Russian upper leather, while the wood has hundreds of economic uses, not the least of which is in boat-building. The wood is much used for flooring, house-furnishing, and even for dimension lumber. It finishes better under the plane than the willows we know, and does not warp, shrink, or check, as do the willows with light, spongy wood. In all respects it is superior to the White Willow, not the least one of its merits being its ability to grow on high, dry land, and to maintain healthy foliage in a dry interior climate.

Populus certinensis is a rapid-growing upright species of the poplar from Central Asia. Its leaves are peculiarly large and thick ; hence it will thrive and make rapid growth on dry upland prairies in North-west Iowa and Dakota, where the cottonwood fails on account of leaf rust. Its wood is heavier, closer grained, and better adapted to many economic uses than any of our American poplars.

How to grow the Lilac.—Everybody knows the lilac ; and thanks to its easiness of propagation, one meets with it oftener than any other shrub. Common as it is, who does not love the shrub at lilac-tide ? As commonly seen, there are a few branches of an older growth, with here and there a flower scattered over them, with a wilderness of undergrowth of all ages, from the sprouts of a year's growth, to that of the age of the bush in its present position. To be seen in perfection, they should have clean stems, either as a single plant, or, if a bush, three, or any number desired. Every sign of a sucker is to be kept away. The result is, that the bush or tree exerts its strength in forming a head to the stems left to grow, instead of exhausting itself in a mass of sprouts of all ages, with nine out of ten too weak to furnish a flower-bud. Trained to single stems, the whole head should be a mass of flowers every year. To attain this, it is necessary, as soon as the flowers have dropped, to go over them and cut out all the old flower-stems ; otherwise seed-pods will form and the bush exhaust itself forming seeds, instead of preparing flower-buds for the coming spring. This is the reason that, as mostly seen, the great mass of flowers come every other year, instead of every year, as they will do if given a chance.—*Prairie Farmer.*

We see that "Spratts Patent," of London, S.E., have recently been awarded First Class Gold Medals at the New Orleans and Antwerp International Exhibitions, and at the Paris and Arnhem Dog Shows, for the superior excellence of their Patent Dog Cakes.

FORESTRY

SEPTEMBER 1885.

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EDITORIAL NOTES.

The Select Committee on Irish Industries.—In the draft of the preliminary report prepared by the chairman, Sir Eardley Wilmot, to be submitted to the House of Commons, no matter is deemed more urgent than the reafforesting the thousands of acres of waste land in Ireland. The plea of the reintroduction of ancient industries dependent on wood charcoal is dismissed, in view of the unlimited coal supplies of the neighbouring parts of the British islands. "But it has been given in evidence that planting is very much needed as a shelter for men and animals; for the protection of all agricultural crops from the force of the prevailing winds; for the retention and enrichment of the soil on the mountain slopes; for the prevention of further denudation of uplands, and of the downpour of silt, which, descending in enormous quantities, blocks up streams and watercourses, obstructing drains, and causing destruction by floods and torrents, as in the case of the Bann, the Shannon, and other rivers. The importance of forestry in regard to all the handicrafts of manufactures, in which wood forms an essential ingredient, has been largely demonstrated, while the industries dependent on the supply of willows and osiers show that a very important manufacture cannot be carried out successfully without an abundant supply of home-grown material."

River Pollution.—The rivers Chess and Colne received such a body of refuse from paper-mill boilers on their banks that an official inquiry was recently made into the causes of their pollution. The official inspector encouraged those who were determined to take action against this nuisance to a whole neighbourhood. Since this, the obnoxious mills have closed, owing to lack of esparto grass caused by the outbreak of cholera in Spain, and there is now a purity of water in both rivers to which the inhabitants on their banks have been strangers for years. The modified bill introduced by Mr. Hastings at the instance of the National Society to secure effective legislation against river pollution, was amongst the innocents slaughtered at the close of the late session. Lord Abinger, Chairman of this Society, having its offices at 6 The Sanctuary, Westminster, has issued an appeal for more funds.

PEASANT PROPRIETORSHIP DECLINED. — In August, thirty-eight small lots of agricultural land were offered for sale at Copford, near Colchester, in Essex. The land was tithe free, with land-tax redeemed, and the terms were easy—20 per cent. of the money to be deposited, and the balance paid off in instalments extending over ten years. No offerers came forward, not a single lot was sold.

THE INDUSTRIAL VILLAGE MOVEMENT.—The London Society of which the Rev. Henry Solly is chairman, aims to spread information as to sites and industrial opportunities for well-ordered villages, with cottages of three or four rooms each having a small plot of land attached *in perpetuo,* with suitable provisions by belts of arable and pasture land from growing into towns. Limited space prevents an extended discussion of this proposal to turn the city into the country, of converting squalid St. Giles into rose-covered hamlets in Devonshire. We have elsewhere shown that the proximity of such subsidiary manufacturing centres is one of the most important factors in any large scheme of profitable sylviculture to afford, as at Netherby, a near outlet for cuttings and other bye-products. Any extended topographical distribution of the country for the purposes of reafforestation must include the creation of such new villages. This movement then should possess more or less interest for foresters.

LORD TOLLEMACHE'S ESTATE MANAGEMENT.—On these extensive domains in Cheshire and Suffolk extending to about 33,000 acres, there are 250 cottages each with three acres attached, so that the occupant may keep a cow. There are also fifty-one farms averaging 25 acres, some of which are in the hands of carpenters, blacksmiths, and other artisans residing on the property. There are besides fifty houses built by other resident tradesmen on ninety-nine years' leases. This admixture of large and small holdings yields the happiest results.

TYNEMOUTH.—On Tuesday, August 11th, his Grace the Duke of Northumberland formally opened with a silver key handed him by the Mayor of this thriving northern borough, the park which he has generously presented for public use. His Grace crowned the proceedings by planting what will hereafter be known as "the

Duke's tree," which with others were presented to the Corporation by Messrs. William Fell & Co., nurserymen and landscape gardeners, Hexham. This new gift to Tynemouth will add much to its amenity as a sea-side resort. It has already an aquarium, whilst its ancient and picturesque ruin and romantic walks along the sea-shore have long been prized by Northumbrian holiday-makers.

THE BOSCOBEL OAK.—This famous historic oak was critically inspected during last month by the members of the North Staffordshire Archæological Society at an excursion under the guidance of Mr. J. P. Broadhurst. The true conclusion on a much-mooted question appeared to be that the present oak is merely a descendant of the tree in which Charles hid. Evelyn held that the Royal Oak had ceased to be a living tree in 1662. And measurements made by a practical woodman of the party, showed that the tree now standing is still growing; and that it is not more than 230 years old. In the Bodleian Library at Oxford, a salver or stand for a tankard made from a fragment of the original tree may be seen. Saplings of the famous pollard which sheltered Charles were planted in other places.

SURFACE CULTURE IN FRUIT FARMING.—According to Mr. Kruse, of Yew Tree farm, near Maidstone, fruit-growing best succeeds when the roots not interfered with are left to multiply and interlace, and so take advantage of the upper and more nutritive soil. So he practically uses only the common garden hoe and the pruning-knife, aided by an abundant top-dressing, mainly of bones crushed to quarter-inch size. As much as from £10 to £13 per acre is yearly spent on manure, which is simply placed on the surface of the soil. According to a correspondent of *The Field*, the results have this year been very gratifying, as regards strawberries, gooseberries, black currants, as well as apples, cherries, and damsons.

THE BRITISH FARMER AND THE FORESTRY COMMITTEE.—A writer in the *Live Stock Journal* shows the dependence of most of our edible poultry on the products of our plantations. More woodlands will include facilities for more extensive poultry-keeping. The power of maintaining, in what may be termed semi-domestication, useful birds, is far too little considered. Good edible game chickens, with their parents, may be entirely reared in a wood. Thus turkeys are equally capable of a half feral treatment; and pheasants were, in their earlier years of introduction to this country, kept as "farm stock." If the amount of bird food, in the form of beech-nuts and acorns, or mountain ash berries, be capable of infinite expansion, we may have in Great Britain still other varieties of birds which are good for the table.

Squirrels at Work on Norway Spruce. — In the August *American Gardener's Monthly*, Professor W. A. Buckhout attributes the broken branchlets found under the Norway spruces in the spring, referred to in the previous number of the periodical, to squirrels. These branchlets usually lie among the clumps of trees near where these rodents may be seen feeding on seeds and cones. Isolated trees do not thus suffer; though native Pines (*P. rigida*) do. The editor admits that the Professor's specimens show distinct marks of gnawing; but specimens from New Hampshire appear broken off at a bud—disarticulated as it were—which a squirrel could not do. Such disarticulation may have begun by drying commencing after the rodent had cut the branch.

The Late Dr. Franklin B. Hough.—The *Lowville Times* publishes a supplement of three columns, containing the titles alone of books and pamphlets by our lamented contributor, whose voice, now still, was often heard insisting that the interests of lumbermen and forest preservers on such tracts as the Adirondacks, so far from being antagonistic, were identical. We trust the bill he spent his last energies in perfecting and passing through the local legislature with this intent, will be his best monument.

The American Forestry Congress.—The fourth session of this Congress will be held this month in Boston; the meeting being under the auspices of the Massachusetts Horticultural Society. The programme includes such varied topics as forest legislation, forest fires, forestal education, arbor days, experimental stations, and the like, all of which have been allocated to specialists to introduce. It is understood that Professor Sargent will participate in the discussions, and it is hoped that the meeting may culminate in the establishment of a State Forestry Association; such a result being a consequence of the past meetings at Cincinnati, Montreal, St. Paul, Washington, and Saratoga Springs.

MANITOBA. — From the first Bulletin of the Department of Agriculture for 1885, it appears that tree-planting has not been overtaken in the Province generally with that vigour which many settlers desiderate. An Arbor day would aid this, but the war troubles in the North-West have probably alone prevented its institution. Farmers, notwithstanding, are planting extensively for shelter and ornament, particularly in the eastern portion of the province. Among the varieties planted are maple, spruce, ash, balm of Gilead, oak and elm, as well as a few kinds of imported fruit and ornamental trees.

SYLVICULTURE AT THE ANTWERP EXHIBITION.—In an article in the *Revue des Eaux et Forêts* for August, M. Noel gives his impressions on this department, in which he represented France as a juryman. The pavilion of the Geographical Society of Lisbon, in conjunction with the Colonial Bank of Portugal, contains a magnificent display of gums, cinchonas, rubbers, and timbers alike from the Portuguese colonies of Eastern Africa, as well as Mozambique. The ebony woods and other exhibits of Brazil perhaps merit most attention. French Colonial produce from New Caledonia and Algiers is also praised.

BELGIAN STATE FORESTS.—Since the 1st of August, the administration of these forests has been detached from the care of the Minister of Finance, and reunited to the Department of Agriculture and Public Works.

FORESTRY IN NEW ZEALAND.—Now that Sir Julius Vogel has again assumed the reins of government, he appears to have determinedly set his mind to those proposals of forest conservancy suggested by the Report of Captain Campbell-Walker. The subject formed an item in the Governor's speech during the present session of the Provincial Legislature. As Professor Kirk was engaged for ten months during Captain Campbell-Walker's survey assisting him, and has done the preliminary work occasioned by the present movement, he will probably have the work of forest conservancy entrusted to him. Captain Campbell-Walker proposed an expenditure of £10,000 during the first year, involving a staff of twelve conservators, rangers, and necessary clerks; but the new establishment will likely have a more modest beginning. Meanwhile it may be as well to chronicle some of the facts given in the report of 1877.

Thus, in Southland alone the wages paid for forest industries amounted in that year to £60,000; the Government forests extended from 12 to 15 millions of acres; and during 1876, over 103 millions superficial feet of timber were put through different saw-mills in the colony; during the five years from 1872 to 1877 the colony obtained a total revenue of £9384, 5s. 2d. from its forests.

The question of State Forests was before the New Zealand Parliament on June 25. Sir Julius Vogel stated that under the present Bill it was proposed to borrow £50,000, of which £10,000 was only to be borrowed in any one year. The Commissioner to be appointed would be under the control of Parliament; and it would be his duty not only to look after existing forests, but to plant new ones when necessary. The measure met with a rather vigorous opposition.

PEACH BLIGHT.—In a recent communication, Mr. T. Kirk noted that at Wellington, N.Z., peaches die wholesale, though the trees apparently flower with their accustomed luxuriance. On a sudden change of temperature or a severe frost during the flowering time, the "fruit does not swell, the leaves make their appearance readily and fall quickly—minute orange-coloured blotches are seen on the twigs. These become confluent and black, and then the buds decay. At this stage the plant may die, or if the season prove favourable, a weak autumn growth may be made, and new leaves developed, tassel-like, at the tips of the branches; but a renewed attack the following spring proves fatal, and the plant dies. Plants one year from the seed are attacked as readily as the oldest. Occasionally a tree partially sheltered has suffered less than its neighbour, or has escaped entirely; while two kinds appear to resist the disease more than others, viz. Cornet and Salway, but they are certainly not blight-proof by any means."

MALACCA.—A correspondent of the *Straits* (*Singapore*) *Times*, writing from this lovely Indian island on June 12th, complains that during a long experience he had never witnessed so terrible a drought. The paddy-fields were broken up throughout their areas by cracks and clefts. The indiscriminate felling of forest trees has seriously affected the rainfall in this settlement. Government now propose to keep up the forestry department under the control of the Superintendent of the Botanical Gardens. Our correspondent pleads that efficiency and economy go hand in hand in this new movement. A few efficient overseers with a staff of Malay coolies attached to each could easily do all the planting necessitated by forest denudation in the island. "Forest plants, such as the mirabow, billian, petalling, timpinis, ressah, giam, medang, katanahan, timbesu, pinngah, etc., are hardy enough to withstand a certain amount of exposure, and could be removed from one locality to another to be planted out provided the roots are not injured but are entirely buried in and covered by the soil. If planted in holes of sufficient depth and well shaded, these plants would thrive well enough. Care, however, must be taken that they receive sufficient moisture at the beginning, until the roots begin to spread in the subsoil."

NOTABLE TREES AT WHITTINGHAME.

AMONGST the many fine trees and shrubs which abound in the beautiful grounds of Whittinghame, East Lothian, the property of A. J. Balfour, Esq., M.P., we noticed on a recent visit a handsome specimen of *Araucaria imbricata*, bearing eight female cones, each as large as a cannon-ball. This tree, like most of the conifers at Whittinghame, was in vigorous health, about 40 feet in height, and clothed to the ground with healthy branches. Not many yards distant stands, perhaps, the most remarkable tree of its kind in Britain, viz. a gigantic specimen of the "Swamp Gum tree" of Australia (*Eucalyptus viminalis*), quite the dimensions of a forest tree. The tree in question was planted in 1846, and was brought as a seedling from Australia by a member of the family. It grew rapidly in its new home until the memorable winter of 1860–61, when it was cut down to the ground by the severe frosts which prevailed during that winter. During the following summer it broke away into four limbs, which have now reached a height of about 60 feet, forming a tree of a novel and striking character. The girth of the stem below where the massive limbs project is nearly 12 feet, and the branches are laden with flowers and an abundance of last year's seed-vessels. The question arises, How has this gigantic *Eucalyptus* escaped uninjured during the severe winters which have occurred since 1860–61? Is this a hardier species than others which have been tried in this country, or has the constitution of this tree become hardened by acclimatization? Mr. Garrat, the able and intelligent head-gardener at Whittinghame, furnishes a more satisfactory explanation regarding this matter. He states that during severe seasons, when his neighbours' thermometers register below zero, not more than 24 degs. are registered at Whittinghame. The presence of such handsome specimens of *Cupressus funebris* and *Picea Webbiana*,—the latter at least 50 feet in height and bearing numerous cones,—abundantly testifies to the mild and genial nature of the climate at Whittinghame.

There is here also a venerable yew tree of enormous dimensions. The stem is little more than 10 feet high, to where the branches are given off, the circumference being nearly the same. The branches, however, have a radius of about 100 yards, many of them having now become rooted into the ground, thus forming an immense bank of the densest foliage, and completely covering the raised knoll on which the tree is planted. Tradition loves to linger round most of the old yews in this country, and the venerable tree at Whittinghame is no exception. The story runs that Bothwell and the other Scottish nobles opposed to Darnley, the husband of the ill-fated Mary Queen of Scots, repaired to the sequestered shade of this very tree, where they formally entered into a covenant to compass Darnley's death. Be this as it may, the tree is certainly old enough to have rendered this possible. R. L.

AUSTRALASIAN FORESTS.

BY HENRY F. MOORE, FROME, SOMERSET.

SO much of the Australian continent remains unexplored that the approximate area of its forest lands cannot be even conjectured. One thing is certain, however, and that is, that a much smaller portion of its surface relatively speaking is wooded than was the case on the North American continent when it was first colonized by Europeans. Nevertheless, it and the neighbouring islands of Tasmania and New Zealand contain immense forests of valuable timber for both constructive and ornamental purposes. These are described in a recent report to the American Government. There are 150 varieties of the *Eucalyptus* or gum tree, some of them attaining a gigantic height, as, for example, the *Eucalyptus amygdalina*, which has been known to reach an altitude of 480 feet. The specific gravity of the *Eucalyptus rostrata*, or red gum, which is largely used for railway sleepers, nearly equals that of the oak, while it is capable of sustaining a much greater pressure to the square inch than either oak or teak. In point of durability the harder varieties of the *Eucalyptus* will last four times as long as the former. Many of the Australian trees, as, for example, the *Eucalyptus botryoides*, the *Cedrela toona*, the black-wood, and the *Frenela endlicheri*, or cypress pine, and the numerous indigenous cedars, are beautiful in grain and colour, and take a fine polish. The Kauri pine of New Zealand, which, with a diameter at the base ranging from 10 to 20 feet, attains to the height of 160 feet, and often presents a columnar trunk of 100 feet without a branch, is much prized for its timber by the shipbuilder, the miner, the railway engineer, and the cabinetmaker. What renders it exceptionally valuable is that it exudes a gum almost equal to copal, the choicer qualities of which will sometimes command from 584 to 730 dollars per ton in the London market. The *ruriu* or red pine, an ornamental as well as useful timber, some of it resembling rosewood, though of a lighter brown colour, is largely used in the manufacture of furniture. With the *totara,* a durable and clean-grained wood, not unlike cedar in appearance, the Maoris made their largest canoes, and almost invariably constructed the palisading of their " pahs." The forest trees of Western Australia claim special attention on account of their useful and valuable properties. Among these may be mentioned the tuart (*Eucalyptus gomphocephala*), an extremely hard, heavy, and close-grained wood, which furnishes the strongest timber known, its transverse strength per square inch being 2·701 as compared with the English oak, which is 2·117, or the Indian teak, which is 2·203. Hence it is extremely valuable for shipbuilding purposes. The karri (*Eucalyptus diversicolor*), also highly prized for its timber, attains to colossal dimensions, sometimes measuring 60 feet in circumference at the base, while its tall and shapely trunk rises to the height of 300 feet without a single limb. The jarri (*Eucalyptus marginata*), which resists successfully the attacks of both the white ant and the Teredo navalis, is unsurpassed for the durability of its timber. Specimens of jarrah piles, after being exposed between wind and water for over forty years, are still found to be in an almost perfect state of preservation. According to the Director of the Botanical Gardens at Sydney, no country has been favoured by nature with a greater variety and abundance of trees yielding strong, beautiful, and durable timbers, than the colony of New South Wales. Its magnificent forests contain woods valuable alike to the cabinetmaker and the shipbuilder, including such timbers as the different species of the *Eucalyptus,* the red cedar, turpentine, rosewood, mountain ash, and tulip-wood, most of which are beautiful in grain, rich in colour, and susceptible of a high polish. Queensland is richly endowed with immense tracts of forest lands, furnishing large quantities of valuable timber, and indirectly supplying the soil with an abundance of rain. The enormous fig trees and gigantic *Eucalypti* tower aloft and spread out their great arms, festooned with vines and flowering parasites, which throw themselves over every spreading branch, and deck it with their varied and brilliant colours; the tall pine trees, the cedar, the myrtle, the rosewood, and tamarind trees are also forest representatives.

HISTORICAL NOTICE OF SOME CELEBRATED TREES.

BY THE LATE PROFESSOR WALKER ARNOTT, LL.D.

Part IV.—The Chestnut, Oriental Plane, and the Elm.

The Chestnut.

THE chestnut tree (*Castanea vesca*) is generally understood to be a native of Asia Minor, but it is abundant, at all events, as a naturalized tree in the mountainous parts of the south of Europe. The famous *Castagno di cento cavalli,* or chestnut of the hundred horses, upon Mount Etna is probably the largest tree in Europe. It is so called, according to tradition, because Jeanne of Aragon and a hundred cavaliers of her suite took refuge under its branches during a heavy shower, and were completely sheltered from the rain. Brydone, who visited it in the year 1770, has given a particular description of it. He states it to have been 204 feet in circumference, but later observers reduce these dimensions to 190 or even 180 feet. It has the appearance of five distinct trees; but whether there were really as many trunks originally, or whether, as in the case of the Fortingall Yew, these trunks be merely portions of one great one, it is difficult to judge. Most travellers, however, who have examined it, incline to the opinion that the trunk is actually formed by the union of five stems all springing from the same root. A hut has been erected in the hollow space in its centre, with an oven, in which the inhabitants dry the chestnuts and other fruits which they wish to preserve for winter, using at times for fuel, pieces cut with a hatchet from the interior of the tree. The chestnut throws up shoots very readily from the root, and Philippi says it is a general custom in Sicily to cut them down after they have attained a considerable size, when the new stems which are thrown out from the base shortly become trees again. This certainly furnishes a very weighty reason for supposing such to be the structure of the *Castagno di cento cavalli;* but there are other colossal chestnuts also upon Mount Etna with undoubtedly single trunks. One of these, known by the name of the "Chestnut of St. Agatha," is 70 feet in circumference; another is the "Della Nave," which is 64 feet; and the third, called "Della Navella," is 57 feet. Some general idea of their age may perhaps be formed by a comparison with other individuals whose history is better known, such as that at Sancerre, described by Bosc, which, although only 33 feet in girth at 6 feet from the ground, has been called the "great chestnut of Sancerre" for 600 years. Though none of the English chestnuts rival the

Sicilian ones, yet there are some enormous ones in this country. That at Hitcham Priory, in Hertfordshire, had in 1789 a circumference of more than 14 yards (or 42 feet) at 5 feet from the ground; and though the internal part was decayed and hollowed by time, the external part and the leaves were vigorous. Grose found four chestnuts in the garden at Great Crawford Park, Dorset, 37 feet in circumference, and though shattered and decayed, it still bore good crops of fruit. The great chestnut at Tortworth in Gloucestershire, and which is a signal boundary to the Manor of Tamworth, has however had dimensions as well as age assigned it belonging to few other English trees. In 1720, it measured 51 feet in diameter at 6 feet from the ground. Lysons, however, by later measurement, in 1791, made it out to be only 45 feet 3 inches. It bore fruit abundantly in 1788. In the reign of Stephen, who ascended the throne in 1135, it was already remarkable for its size. But even this tree, which has probably long since celebrated its thousandth anniversary, does not equal the smallest of the three Sicilian chestnuts.

ORIENTAL PLANE.

The oriental plane (*Platanus orientalis*) is one of the largest trees of temperate climes. Pliny speaks of one in Lycia whose trunk, hollowed by age, presented a cavity 81 feet in circumference, in which the Consul Licinius Mutianus slept with eighteen persons of his suite; and Olivier, Dr. Walsh, and other modern travellers describe one in the valley of Bujukderéh, three leagues from Constantinople, which is 90 feet high, and with a stem 150 feet in circumference. The trunk is hollow within to the level of the soil; the cavity is 80 feet in circumference, and occupies a space of 500 square feet. Vautier mentions one in Tiresia, near Pontus, which was 20 feet in diameter. There are no certain means of determining the age of these trees; but Hunter mentions, in Evelyn's *Sylva*, that an oriental plane, planted in Norfolk in 1744, was at the age of 31 years 7 feet 9 inches in circumference at 1½ feet above the ground, which yields an average annual increase of 10 lines; and this calculation applied to the tree at Bujukderéh would make it 150 years old, although if we consider that young trees increase much more rapidly than old ones, we might with safety assume it at between two and three times that age, or at least 400 years old. This is on the supposition that the trunk consists of a single stem, but the recent observations of Mr. Webb leave little doubt but this monster trunk is formed by the junction of several original trees planted in close proximity. Indeed, all along the shores of the Bosphorus, there are many groups of younger planes, which for their shade have been designedly planted in a small circle, and their trunks will in time become similarly incorporated. Pliny's Lycian Plane may have also had such an origin.

The Elm.

The elm (*Ulmus campestris*) attains a large size, and lives to a great age. Mention is made of one planted by Henry IV. of France, which was standing at the Luxembourg at the commencement of the French Revolution. One at the upper end of Church Lane, Chelsea, said to have been planted by Queen Elizabeth, was felled in 1745. It was 13 feet in circumference at the bottom, and 110 feet high. Supposing it were planted about 1570, its age would be 175 years, and its annual average increase in diameter about 3½ lines. Piffe's elm, near the Biddington oak, in the vale of Gloucester, was in 1783 about 80 feet high, and the smallest girth of the principal trunk was 16 feet. From the planting of Sir Francis Bacon's elms in Gray's Inn Walks in 1600, and their decay about 1720, one would be disposed to assign the healthy period of the elm in this country to be about 120 years. But De Candolle mentions one at Morges which fell down in 1827, probably undermined by the waters of the neighbouring Lake of Geneva. It was perfectly healthy, and had been growing in a favourable situation. A section of the trunk above the root showed its age to be 335 years; at the same place the diameter was 16 feet 4½ inches English, and immediately below the branches, at 12 feet from the ground, it was 29½ in circumference; of five immense branches one was 15 feet 9 inches English in girth.

Of American elms (a different species, however, from any of the European ones) the most noted is that upon Boston Common. Its girth at 5 feet from the ground (in 1844) was 16 feet 1 inch; at the height of 3 feet it measures 17 feet 11 inches, and near the earth 23 feet 6 inches. It is said to have been planted in 1670 by Capt. Daniel Hendman, then a schoolmaster in Boston, and who afterwards joined the artillery. It is therefore (1846) about 175 years old. In an old map of Boston, published in 1720, the elm is delineated as a large tree. In 1800 there was a great hollow in it, large enough for a boy to hide himself in; but the cavity was then cleared of its rotten wood, and filled with a composition of lime, rubbish from old buildings, and clay. There is now no appearance of the hollow, and the tree is apparently as flourishing as ever. The aspinwall elm in Brooklyn is also of considerable size. It was planted in 1656; and in 1837, when 181 years old, measured 16 feet 8 inches at 5 feet from the ground, and 26 feet 5 inches close to the surface. These give the annual increase of growth of the American elm very accurately, at 4¼ lines in diameter.

A TALK ABOUT SOME TREE LEAVES.

No. I.—Plates III. and IV.

DESPITE several scientists at our shoulders, no formidable words such as they delight in will figure in our two talks with the above title. The twelve leaves depicted either in the two accompanying plates, or in those to follow, are supposed to be scrutinized by a young student as he collects them in the woods, as to their differences, resemblances, or teachings.

Fewer delusions having hold of the popular mind, come oftener under the ken of an editor of such a journal as this, than the belief that the specific name of a tree can at once be determined by the leaf alone. The leaves in the plates now before us bear markedly on this question. In the two plates are depicted the balsam poplar, *Populus balsamifera* (Plate iii. fig. 1), and a species of buckthorn, *Rhamnus alpina* (Plate iv. fig. 3), with leaves practically similar, as well as two species of hazel, *Corylus avellana* and *C. colurna* (Plate iv. figs. 1 and 2), with similar outlines. The single leaf of the mulberry tree, *Morus nigra* (Plate iii. fig. 2), large-lobed, segmented, and hairy, though at first sight clearly specializing the only British representative of its silkworm-feeding neighbour, after all only strictly enforces the theme proposed to be demonstrated. For more than one of the eight cultivated species of poplar have leaves with different characteristics. Thus the mere leaf student notes the similarity betwixt the balsam and black poplars; both have a like leaf-form shaped like a hen's egg towards the stalk, but tapering to a point at the apex; in both also the colour of the under surface is pale, reticulated with a network of hairs. But, as Sir John Lubbock has shown, the leaf stalk of the black poplar thickens at its junction with the leaf, thereby allowing the latter to hang not in a horizontal but pendulous fashion, and so exposing all its surfaces to the influences of the atmosphere. And thus the leaf would appear to be less a characteristic difference of the species, and more an adaptation to its physiological requirements, in some cases marked by geographic peculiarities. For so it is that Professor Schübeler of Christiania, from whose work on Norwegian physical geography the figures are reduced, first showed that leaves from so-called typical southern forms, like *Rhamnus alpina* (Plate iv. fig. 3), assume a development both in size and intensity of colour in the Scandinavian summer unknown in their native habitats. Gaston-Bonnier and others have subsequently obtained rich results in following out this vein of investigation. But even local instances testify how exposure to sunlight and other meliorating physiographic influences may further plant development, of course including leaf-perfecting. A fortnight since we observed in the outskirts of Stirling, in the grounds of a villa sheltered by the high crags at the west of the King's Park, a *Picea* whose leaves and branches out from a sheltering crag showed abnormal luxuriance, whilst those lying towards it were but half developed. Then too a change of leaf-form with varied conditions of growth is shown in young hollies which have spring leaves, thus protecting them from browsing raids by young animals, while the leaves of the older trees are quite unarmed. Then again, Mr. Bunbury demonstrated how evergreen oaks, when kept low, form scrubby bushes with hard prickly leaves.

The balsam poplar has its lower side covered with thick hairy down, thereby coinciding with several other balsams which either for a time, or throughout life, have such protecting covering. If it is to protect the plants against snow, the hazels may also be ranked as having likewise in common such armour. But insects may be attracted to the under surface of the balsam poplar from whose pale yellow leaves in spring comes such a rich fragrance as to render it attractive to grouse and other game birds in coverts, which are said to show traces of such feeding even at table. The balsam poplar has a variety called *candicans,* syn. *P. Ontariensis,* Balm of Gilead poplar, in which the leaves are broader and cordate, or heart-shaped, at the base. So, in fine, the poplar family may afford many other instances in which leaf-form may depend on position, as it flourishes along the whole area of the temperate zone; and observers may further note abnormal forms in specific localities even in this country, where local position, or the prevalence of insects, etc., may be also peculiar. Perhaps the leaves of *Corylus avellana* (Plate iv. fig. 1) and of *Corylus colurna* (Plate iv. fig. 2) may be useful for preliminary training in such woodland studies. Both have come from the far east, yet they seem specially adapted in their present forms to withstand the snows of wintry latitudes. Here they are objects inspiring the sense of the beautiful all through the year, from February till the first touch of frost, when they don the rich yellow colour only to be put off again in early spring. If the broad spread of the hazel leaves given in our plate indicate adaptability for a horizontal sheltering position, so also does the form of the aspen poplar leaf, as will be seen in a plate to accompany our next issue.

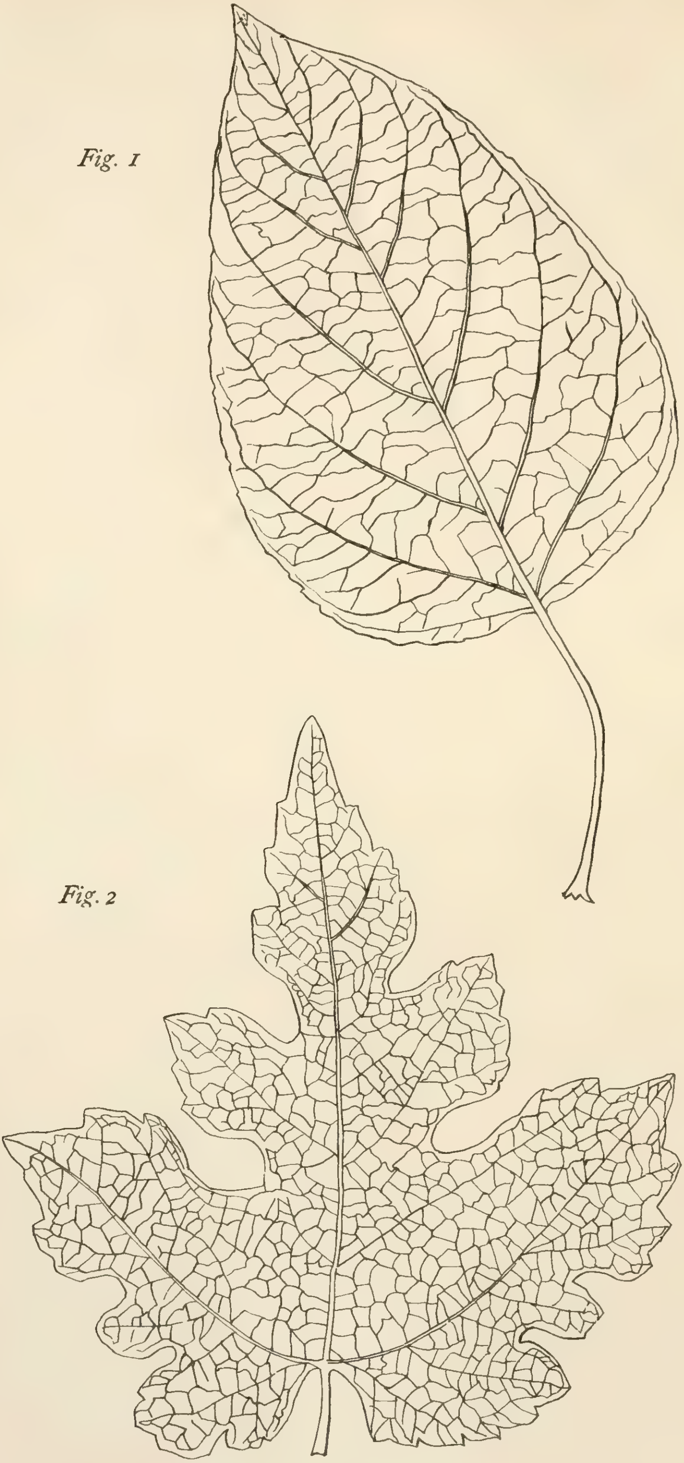


Fig. 1

Fig. 2

McLagan & Cumming, Lithrs. Edinr.

Fig. 1

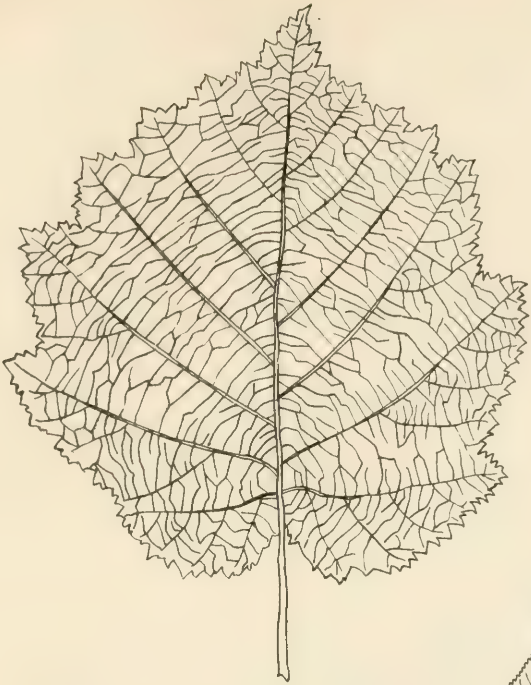


Fig. 3

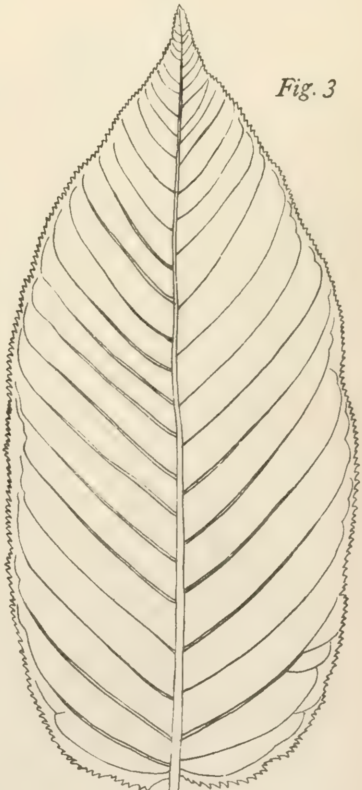
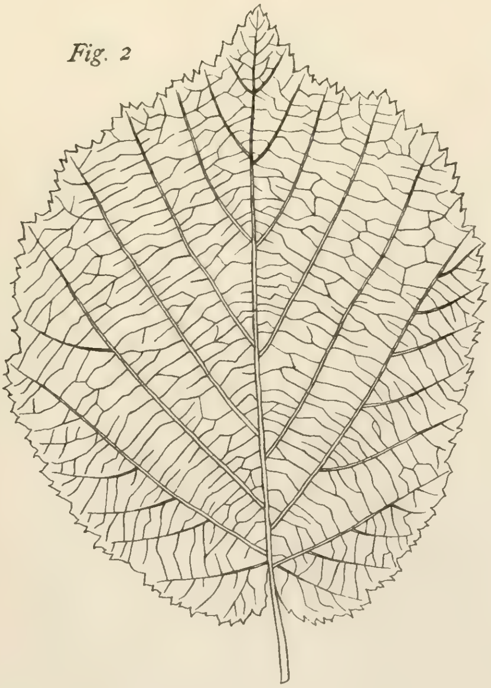


Fig. 2



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THE SCOTTISH ARBORICULTURAL SOCIETY.

TUESDAY, August 4, opened with a bright summer sunshine in Edinburgh, contrasting pleasingly with the previous days of drifting rain. The foresters had good weather, and abundant time for city sight-seeing, as their business meeting lasted but an hour and a half or so, while the afternoon dinner closed far earlier than even elders' hours. The meetings gradually increased in number and interest. About thirty-five attended the annual meeting in the class-room of the Royal Botanic Garden, whilst over fifty sat down to the closing luncheon at Penrith on Thursday, 7th August.

At the annual meeting, Dr. Cleghorn, the veteran president, occupied the chair.

Among others present were Mr. Hutchison, of Carlowrie; Mr. Wm. M'Corquodale, Scone; Mr. M. Dunn, Dalkeith; Mr. John M'Laren, Hopetoun; Mr. John Methven, nurseryman; Mr. James Welsh, nurseryman; Mr. James Alexander, nurseryman; Mr. Alex. Milne, nurseryman; Mr. James Kay, Bute; Mr. D. F. Mackenzie, Morton Hall; Mr. Andrew Taylor; Mr. James Gordon; Mr. Robert Baxter; Mr. James T. Maclaren, Kennet; Mr. Robert Bell, Morton Hall.

ELECTION OF MEMBERS AND OFFICE-BEARERS.

Ten new ordinary members were unanimously elected. The Marquis of Lothian; The Maharajah of Johore; Colonel Michael, C.S.I.; Mr.Tokai, the Chief Commissioner at the Forestry Exhibition, from Japan; the Hon. Wm. Russell, British Guiana; Mr. Edward Jack, New Brunswick; the Hon. Robert Southey, C.M.G., Cape of Good Hope; Sir James Campbell, Bart., Dean Forest; Sir Joseph Hooker; Professor Dickson; Dr. Cleghorn; and Sir John Lubbock, were unanimously elected honorary members of the Society. Dr. Cleghorn was unanimously elected president for the ensuing year.

The following were elected vice-presidents:—Lord Balfour of Burleigh; Mr. Malcolm Dunn, the Palace Gardens, Dalkeith; Mr. Robert Hutchison, F.R.S.E., of Carlowrie; Mr. John M'Gregor, forester, Ladywell, Dunkeld; Professor Dickson, Edinburgh.

The following were elected members of Council:—Messrs. Robt. Lindsay, Royal Botanic Garden, Edinburgh; James Alexander (of Messrs. Dickson & Co., nurserymen and seedsmen), Edinburgh; John Methven (of Messrs. Thomas Methven & Sons, nurserymen and seedsmen), Edinburgh; D. Scott, forester, Darnaway Castle, Forres; Daniel Dewar, forester, Beaufort Castle, Beauly; William M'Corquodale, forester and wood surveyor, Scone, Perth; Robert

Baxter, forester, Dalkeith Park, Dalkeith; John Michie, forester, Balmoral, Ballater; John T. M'Laren, overseer, Kennet, Alloa; James Kay, forester, Bute Estate, Rothesay; John M'Laren, forester, Hopetoun, South Queensferry; D. F. Mackenzie, factor, Morton Hall, Liberton, Edinburgh; John Lamont, nurseryman and seedsman, Edinburgh; Charles Buchanan, overseer, Penicuik House, Penicuik; Mr. James Watt, Carlisle. Secretary and treasurer—John M'Laren, jun., 5 St. Andrew Square, Edinburgh. Auditor—John Ord Mackenzie, of Dolphinton, W.S., 9 Hill Street, Edinburgh.

The proceedings of the meeting were pleasingly devoid of rigid formality. No attempt was made at the reading of scientific papers. Indeed, the Chairman led off in the fashion of entertaining and instructive conversational discussion which prevailed through the whole proceedings, and which would have been yet more pleasing had the audience generally taken greater part in it. Dr. Cleghorn referred to the good progress the Society had now made, as the funds were in fair condition, and it now contained from 700 to 800 members at this its thirty-second anniversary. The International Forestry Exhibition, the Society's great work, was yet affecting for good in many ways the progress of forestal science. The excellently complete account of the Exhibition in the new number of the *Transactions* was by Messrs. Dunn & M'Laren, who had hid their work in the modest garb of the anonymous. Then the volume of Prize Essays just published, would be the standard literary memorial of this great undertaking. Then there was Sir John Lubbock's Parliamentary inquiry, which for a time only was suspended. It had been said that Great Britain was not so needful of such a school as other countries, because her abundant supply of coal rendered the people comparatively independent of wood for fuel. This was entirely beside the question, for the adoption of a complete system of forest conservancy was of the very greatest practical importance. There were about ten millions of acres of wood in England, Ireland, and Scotland, at present of only nominal value, which, under a proper system of constant conservancy, would become a most important source of wealth. On that ground alone there could not be the slightest doubt about the advisability of establishing a Forest School. The forests of Norway and Sweden had now been placed under conservancy regulations, with very great advantage in every respect to those countries. Then, again, as Great Britain possessed in her dependencies and colonies more extensive forest lands than any other nation, it was important to provide for this nation a thoroughly trained staff of practical foresters. To Edinburgh was due the credit of having first taken up the idea of forest schools, and with the view of establishing one, the Town

Council purchased the beautiful Arboretum for a sum of £20,000. Donations had also been received from various Governments for the foundation here of a forestry museum. In all respects, therefore, Edinburgh was the place in which such a school should be established. Many years ago Sir Robert Christison urged the importance of the subject; Professor Balfour called attention to it in 1876: Mr. Hutchison spoke of it in 1877; and before going out to Madras, the Right Hon. W. P. Adam bore testimony to the extreme importance of the subject. Mr. Adam left his MS. on the subject with him, and he (the Chairman) read it the other day to the Committee of inquiry of the House of Commons. It proved most effective. The Marquis of Lothian had also spoken very effectively in favour of the proposed institution. For the establishment and endowment of a school of forestry, with museum attached, a sum of £10,000 would be required. A sum of £800 had been intimated to the Forest School Committee. That was certainly a small sum, but it was a commencement.[1] And he trusted that, with this commencement, matters would proceed rapidly towards the complete attainment of the important object they had in view.

On the motion of Mr. John Methven, a vote of thanks was accorded to Dr. Cleghorn, both for his remarks and for the activity and zeal he had shown, not only in regard to the science of forestry, but also to the proposed establishment of a school of forestry.

STATE OF FUNDS.

Mr. John M'Laren, jun., reported on the state of the Society's finances. The income for the year amounted to £348, 9s., expenditure £308, 1s. 9d., leaving a balance of £40, 7s. 3d. The income included £100 drawn from the capital account, and was otherwise derived principally from annual subscriptions. The expenditure was chiefly for prizes, salaries, and accounts paid. The total funds now amounted to £405, 2s. 10d. The report was adopted on the motion of Mr. Dunn. A recommendation by the Council that £50 should be set apart towards the establishment of a school of forestry was adopted on the motion of Mr. Hutchison of Carlowrie.

PRIZE ESSAYS.

The Chairman reported for the judges on the competitive essays, the number of which, he said, was much below the average, because, with other reasons, several of their former competitors had been occupied in writing essays for the late International Forestry Exhibition. For an essay on "The Douglas Spruce," giving a

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[1] See our advertising columns for Committee's appeal.

résumé of the cultural peculiarities and economic properties of this tree so far as known, a silver medal was awarded to Mr. A. D. Webster, Penrhyn Castle, Bangor—the author. Mr. Webster was also the author of papers on "The Corsican Pine"—giving a good account of all that was known of the tree; "The Formation and Management of Game Coverts," a short essay, for which the judges had awarded a bronze and a silver medal respectively. "The Degeneracy among the Artificial Plantations of this Country," a carefully illustrated essay of seventy-three pages, by Robert Coupar, forester, Ashford Castle, County Galway, gained a second silver medal. A very creditable essay on "The Formation of Plantations," by David A. Glen, assistant forester, Gartshore, Kirkintilloch, gained a first silver medal. A second silver medal was awarded to Alexander J. Forbes, Muir of Ord, for a dendrometer, the principle of which, the Judges considered to be similar to Mr. Mackenzie's dendrometer. For an essay on "The Present and Future Prospects of Arboriculture in North Lancashire," a first silver medal was awarded to George Dodds, Wyreside Cottage, Lancaster. The judges and committee on the *Transactions* of the Society were re-elected.

PROPOSED CHANGE OF SUBSCRIPTION RATES.

Mr. Dunn gave notice that the following changes of the rates of subscription approved by the Council would be submitted for the decision of the Society at next annual meeting, viz.:—Landed proprietors, life subscription £10, 10s., annual payment £1, 1s.; factors and nurserymen, life subscription £5, 5s., annual 10s. 6d. as before; head foresters and managers, life subscription £3, 3s., annual subscription 6s.; assistant foresters, £3, 3s., annual subscription 4s. These charges, it was explained, would only affect new members elected after their adoption.

CONVERSATION ON FOREST SCHOOL.

Mr. Dunn led off a conversation on the desirability of the Edinburgh Forest School, occasioned by the report on the education of young foresters being called for. Mr. Hutchison desiderated active steps being taken for a lectureship on Forestry during next session of the Edinburgh University. Mr. M'Corquodale thought Government should purchase a Highland estate on which students could supplement theoretical lessons by those on the practice of forestry. It would pay to use the public funds for such an object. And with this Mr. Methven coincided, while urging the importance of Edinburgh being immediately chosen as the site of the new institution. The Chairman, in summing up the discussion, called attention to the fact that when five of our colonies wanted forest directors they had to borrow them for two years from the Indian forest service. A British forest school should supply such needs of our dependencies.

A PROPOSED MUTUAL BENEFIT ASSOCIATION.

Another interesting discussion was raised by Mr. Dunn as to the share the Society should take in establishing a Mutual Benefit Association for arboriculturists and horticulturists, specially in the northern parts of the kingdom. Mr. Methven had been taking a very warm interest in this new movement, and he testified to its need from a lengthened personal experience of the class whom it was proposed to combine together for their mutual benefit. Some members thought that foresters and gardeners were mostly connected with similar institutions already in operation amongst the working-classes. On the other hand, it was generally agreed that cases of distress were all too rife, from the Scottish working-classes being too independent even to look for such mutual aid as this was solely proposed to be. It was ultimately agreed to request the Council to consider the matter in all its bearings; and to formulate a scheme of action by the Society to be considered at next annual meeting.

After passing the usual votes of thanks, the meeting separated.

THE ANNUAL DINNER

came off in the Waterloo Hotel. Dr. Cleghorn occupied the chair, and Mr. John Methven was croupier. The attendance was good. Pressure on our space compels this brief notice; while we reproduce the most important ideas interchanged in another form elsewhere. The most pleasant diversity of the usual after-dinner routine was the presentation by the Chairman to the Secretary, Mr. M'Laren, of a gold watch in appreciation of his honorary services in connection with the court of the Arboricultural Society at the International Forestry Exhibition. Mr. M'Laren gave up his holiday and toiled night and day at the proper display of the Society's exhibits: So some members and friends of the Society determined individually to subscribe to acknowledge such worthy service, which has indeed been spread over many years.

THE SCOTTISH ARBORICULTURISTS IN THE VICINITY OF CARLISLE.

WAVERLEY STATION, Edinburgh, on August 5th, was the rendezvous for the annual excursion of the Scottish Arboricultural Society, under the guidance of Dr. Cleghorn and Mr. Dunn, this time for two days to Langholm, Carlisle, and Lowther, near Penrith. "A doubtful day," said more than one of those wearing the fir-sprig emblem as the early morning train started for Langholm.

The last part of the day's programme was to compass the Netherby Woods, which were a tangible solution on a great scale that timber-growing pays. It seemed a pity that so wide an area was proposed. Had not the *Times* just suggested that British and American tourists seek too much a rapid bird's-eye view of a district; better far explore a small portion of it in detail, if the mind is to carry from it fixed and pleasing ideas, and not a chaotic jumble. Did not the configuration of the country on this railway very markedly suggest the influence of physical configuration and soil on tree-growth? Such were the two clues for gaining clear ideas of passing objects, suggested on this journey.

The districts above and beneath Langholm gave scope enough for gaining such ideas. It was traversed after all, under a fair sky, in brakes, under the guidance of Mr. Doughty, and in the company of Mr. Maxwell of Munches, Major Dudgeon, and the English contingent of the sister society, wearing oak leaves, who joined us at breakfast. We thus formed a body of travellers, adorned with leafy emblems, attracting no small admiration from factory operatives at dinner-time, having previously startled the browsing sheep on the high uplands above the thriving woollen factories. We first rode up into a sort of *cul-de-sac* containing Burnfoot and Langholm policies, surmounted by bare green hills, with singularly even summits, at once recalling Washington Irving's remark that the mountains in Walter Scott's country had all a similar physiography. Two waters descend from the vast rounded gathering-ground, the tableland of southern Scotland, which is indeed the watershed of the Tweed and tributary streams on the Roxburghshire side, into the thick-wooded valleys we were driving through, where a thick alluvial covering hides the sorely contorted and jointed silurian rocks. At many a point along the ascending roadsides, these rocks come right to the surface at the sky-line. Has this country of Telford of Eskdale Moor, or Malcolm of Persian renown, whose monument on the outlying ridge above

Langholm breaks the scenic monotony for many a mile, been always so? Not so, says the geologist, who reads at least two great physical convulsions on their quiet bracken-covered flanks. At one time the horizontal beds were carried up from the primeval waters by bendings, puckerings, uplifts, and downthroes which formed the southern Scottish Highlands; while, at a later period, the great inland lakes, which, in conjunction with glaciers or other torrential motor-givers, formed the peaceful valleys with the silvery streaks of the Tweed and its tributaries, were bounded by this outlier at Langholm. But the thick gravels and boulders down the burn-sides, as well as along the whole course of the Liddell, tell of present-day torrents. Thus the soil has originated for the magnificent woods round Langholm Lodge, which contain magnificent beech and plane trees, noble old Scotch firs, as well as select specimens of *P. Albertiana*, *Pinsapo*, and *Nobilis*, besides great *Arbor vitæs.* One or two straggling trees were seen half-way up the hill-tops; solitary representatives of old monarchs who, if allowed by the woodman's axe, might have saved the hills from being stripped of the soil, yielding such admirable tree-growth below. Will it pay to re-afforest?

The silent testimony of several acres of splendid larch timber blown down by the gales of two years since, which no merchant will purchase, is the local answer. On the other hand, the plantations under Mr. Doughty's supervision on the Langholm and Canonbie road, were the best bit of woodland which struck the eye of the traveller betwixt Scotland and England in the old coaching days. All through their two days' journeyings the foresters saw no nobler specimens of trees—spruces which commanded admiration from their height as well as the fantastic bifurcations of their branches; and oaks whose leaves had a russet brown, betokening a pathological abnormality not previously met with by the practical observers present. Two spruces measured 23 feet 7 inches and 37 feet 11 inches in circumference respectively. And a sycamore at Hagg-on-Esk was found to be 16 feet 8 inches in circumference at 5 feet from the ground; while a height of 90 feet was assigned it. Incipient architects should take this drive, if they wish suggestions of new Gothic combinations resembling those of Sir Walter Scott's monument at Edinburgh. But the grateful hospitality of Mr. Doughty at his residence, and luncheon at Canonbie, recalled imaginative travellers that man is made of mould. That sentiment substantially recognised, and thanks voted to guide and his Grace the Duke of Buccleuch, the courteous proprietor, we set off for Netherby under the direction of Mr. Baty.

Journeying with a man for six hours is perhaps the best possible way of knowing his character, next to transacting business with him. Our "brake" company was of a miscellaneous kind, from the whaling captain of the North Pole beside the driver, to Perthshire foresters, Cumberland wood wardens, and land agents from York and Warwick shires. We were an amicable, joyous company. On crossing the English border, our northern arboriculturists must needs sing out "Scots wha hae," followed by the whole company afterwards trolling forth "Heart of oak." All ancient local animosities were felt to be as thoroughly buried as the fossil scorpions which geologists have lately found in the flagstones in the bed of the neighbouring river Esk. The present writer at least was struck by the high mental and business calibre of the southern woodsmen. They certainly require no rigid routine of continental forest school training.

Some of the company made a hurried run up to Woodhouselee farm-steading, to inspect Major Dudgeon's compensating lever silo. Instead of stones, a series of fine levers, at the farther end of which iron circular cwt. weights are attached by a slit in their centre, whilst their farther ends rest in iron ratchets on an upright, from which the pressure spreads equally on the hay below the wooden platform. As the pressure becomes spent from each lever, it starts from its ratchet, when another weight is placed on its farther end after it has been replaced in a higher hole. A pressure of 100 lbs. to the square inch can be thus laid on the ensilage. Indeed, about 90 tons may thus be forced on the mass below the platform. The cows prefer food thus prepared to that coming from ordinary silos. Indeed, the bower has raised his offers when this food was promised to be served.

Netherby woods, under the guidance of Mr. Baty, whose lecture in November's *Forestry* showed how the returns from 2800 acres of land, with an agricultural value of 7s. 6d. per acre, had yielded 13s. 8d. to 18s. 7d. of profit per acre from thinnings! Here was a practical demonstration by the best authority how timber-growing pays! But, unfortunately, our leader was passing through a period of heavy domestic affliction; and three hours' wanderings through the policies, containing many individual trunks of surpassing grace, left no time to overtake the 800-acre wood originally set down in our programme as a type of the celebrated estate improvements. The marked geologic differences in the soil served to give a character to arboreal growth different from the district we had been traversing throughout the day. No doubt this was taken sufficient advantage of by assiduous care and skill everywhere manifest, whether in the long lawn-trimmed walks, or in the exquisitely beautiful flower borders before the hall. In the Pinetum grows a

Canadian larch, *Larix Americana,* transplanted March 1882, now 13 feet high, and 1 yard in spread; a host of other young conifers, as a *Picea amabilis* with cones, and a young *Wellingtonia* showing vigorous growth. Before Mr. Baty's house flourishes a Turkey oak (*Quercus cerris*) planted in 1826, exactly the age of Sir Frederick Graham, and now 65 feet high. After proffering to Sir Frederick Graham, Bart., lord of the manor, our grateful thanks for his kind permission in allowing the visit, and to Mr. Baty for his guidance and parting hospitality, we sped on our way for Carlisle. The evening hour of travel was diversified by discussions on forestal economics, and overtures on the driver's horn, which for the nonce made more than a hundred cattle, erst peacefully browsing in the pastures on both sides of the road, earnest followers in the path of the arboriculturists. Netherby estate is bounded on either side by main trunk railway lines, using the wood for their own purposes, and conveying it to the great mining and manufacturing centres of the vicinity. Further, the bobbin factory at Longtown, in the centre of the estate, takes from 10,000 to 16,000 cubic feet of inferior wood yearly, no small outlet for bye-products. Markets, transport, and easy disposal of small wood were considered to be essential factors in successful wood-growing. All must be united in the same locality. A wood warden of a Cumberland estate, on which the main trees were oak, ash, and elm, could not get quit of his subsidiary wood; hence no profit was shown in his estate book. Another found his woods profitable, though situated in an upland Northumberland district, where the agricultural value of the land was only 2s. 6d. per acre; but then their railways and collieries were near at hand. The value of such annual thinnings as hop-poles in the south, statedly made woods give, according to another representative, so much as £10 to £17 per acre yearly. Might not Sir John Lubbock's Forestal Committee, which has only suspended its sittings, work up these forestal statistics for the common progress of British forestry? Only Indian evidence has as yet been led at it.

The arborists met at Knowefield Nurseries, situated on a bluff of the river Eden opposite to Carlisle Castle, early on Thursday morning; and were entertained to breakfast by Mr. James Watt, of Messrs. Little & Ballantyne. Here were shown the nucleus of this firm's great reafforestation work now under Government recognition in the Isle of Man and elsewhere. The company congratulated themselves on having Dr. Cleghorn as their spokesman. For the worthy host compassed the bearings of forestry on restoring national weal in his after remarks, and backed these by a powerful letter from Dr. Lyons, M.P., whose Parliamentary endeavours in our good cause appear only to have increased with the waning session. The Mayor of Carlisle spoke for the city. The town-clerk and several local civic and clerical dignitaries were also present. The soil and situation of the nursery, which extends to 150 acres, appears specially suited for the rearing of healthy plants ; in two instances inspected nine months' plants raised from seed looked better than transplants from elsewhere of two years old. Amongst other vigorous plants in the borders were noted those of *Abies Alcoquiana, A. Hookeriana, Larix Koempferi, Picea Veitchii, P. concolor, Pinus Jeffreyi, P. montana, P. monophylla, P. Balfouriana, P. Pyrenaica, P. larix, P. sylvestris, pyramidalis,* new var. The thousands of rose blooms in this establishment founded by two Scotchmen more than seventy years ago, alone reminded Edinburgh visitors that they, though looking northwards, were treading English soil.

The London and North-Western Railway crosses by a high viaduct near the Penrith entrance to Lowther Castle, the ancient seat of the Lonsdale family ; so the passing traveller can gain no idea of this graceful Gothic pile. The valley we drove through for several miles, has a thick covering of alluvium resting on the flat *Poikolitic* sandstones which overlie here the upright *silurian* strata visible in the neighbouring peaks and fells ; and thus it has come to pass that the savagely picturesque mountains of the Lake country encircle a district of surpassingly equable tree growth, whether as regards diameter of stem or height of trunk. Over the park, thick beds of loamy clay or sand took the place of the stony gravels and boulders found in the upper reaches of the Liddell ; though the bed of the Lowther itself showed palpable signs of the gravels it brings down in its rapid descent from the lofty Shap Fell ; so in this park, instead of fantastically bifurcating trunks and branches, magnificent oak trunks were prominent in the landscape. A pollarded oak, which girthed 15 feet 9 inches, was valued by a Midlothian forester at about £40. He had lately sold a somewhat better trunk to an Edinburgh firm for £80. A neighbouring oak measured 18 feet 1 inch in circumference at 4 feet ; its height was estimated at 100 feet. Two old trunks with decayed shells testified to wood growth for beauty, and not money value ; one was 35 feet in circumference at its base, and 22 feet 7 inches at 4 feet from the ground ; while the other gave corresponding measurements of 37 feet 6 inches, and 23 feet 2 inches. So, too, were parallel measurements made of great beeches, Scots firs, and other conifers studding the holms and heights along the windings of the river. The Lowther Park representatives of "Adam" and "Eve" are two Ashes covered with green leaves, though one has been damaged by fire, and the interior of the other is but touchwood. On the shoulders of "Adam's" trunk, which girthed 21 feet 7 inches at 4 feet, grow a crop of self-sown elms, gooseberry bushes, and the like.

On many of the oak trunks in the park, mushrooms were plentiful. They had not been observed in the Langholm traverse; indeed, the present company apparently agreed with the mass of British foresters, in this unlike their Indian brethren, that the study of wild-flowers accompanying special forest trees is useless, thus acting wrongly. But the attention given to the Castle Garden more than made up for this; as this creation of Mr. Frederick Grant, the present gardener, struck the practical men present as one of the best floral arrangements they had yet inspected. Over 4000 rose bushes, many of them 20 feet high, interspersed with proportionally tall Delphiniums of dazzling light-blue colour, struck even the non-specialist, whose satiated eyes had but to look on the green *Thujopsis dolobrata*, *Wellingtonias*, or Scots fir, a neighbouring one girthing 8 feet 4 inches and 60 feet in height, to return again delighted with the more brilliantly contrasting colours.

The Earl of Lonsdale permitted the company to inspect the public rooms, and picture and sculpture galleries of the Castle, besides providing an entertainment of cake and wine. But dissertations on artistic treasures embracing social history from the early days of Egypt and Greece, to that of London in last century depicted by Hogarth, can find no place in *Forestry*; other than their striking emphasis to the life of a tree compared with man. With thanks voted here to the Earl of Lonsdale; Mr. Temombs, the architect; Mr. Grant, gardener; Mr. Ketchen, foreman forester; and at Penrith, after dinner, to Mr. Little, agent of the estate, and Mr. James Watt, of Carlisle, who had not spared any exertion to make the day's excursion a success, the representatives of the English and Scottish Arboricultural Societies separated at Penrith, each to speed homeward on varied way.

The travellers to Edinburgh journeyed back in the track of a severe storm of thunder and lightning, which terminated a day of warm sunshine, gaining forestal lessons by this grand accompaniment of heaven's artillery. The storm, originating in the German Ocean, could be seen from the hotel windows at Penrith, slowly skirting along the lower slopes of the Pennine chain; and a little after the first peal startled the assembled dinner company, it flashed and pealed till the train passed Riddings Junction to speed up the long incline to Riccarton. As we neared the vicinity of Tudhope Fell, bright sunshine and dry roads gave a new zest to the drive, correcting our wrong impressions of the previous misty morning of this special Border scenery of bold cliffs and numerous falls and ruined watch-towers. All through fell and dale, little streams sped their bright way to join the silvery Esk; eastward the leaden clouds told how the storm was but intercepted by the high peaks of the Cheviots. Nowhere was the dividing line betwixt sunshine and storm more marked than at an extensive belt of shelter plantations on which we looked down above Newcastleton. Here the trees were at work abstracting the moisture from the fleecy clouds, and preventing it damaging populations down the river valley. Of course, we accepted this clue for the reafforestation of much of the neighbouring hill country, as well as that beyond. Passing Hawick, the Merse of Teviotdale was one blink of sunshine; but again the Lammermoors were bounded by lead-grey clouds, while the Eildons had their nightcaps of easterly haar; as we anticipated, on passing Heriot summit, we were accompanied into Edinburgh by drizzly mist. It had rained heavily there through the whole day. In that night's dreams we saw Ettrick forest restored, and thick plantations covering many of the bare hills of Teviotdale, with a corresponding increase in health and wealth given to the whole noble Scottish border land.

Amongst the Scotch contingent who joined in the excursion were Dr. Cleghorn, president; Mr. M. Dunn, a vice-president; Mr. John M'Laren, junr., secretary; Messrs. Adams, Baxter, Douglas, Erskine, Forgan, Green, Gilbert, Kay, Massie, Milne, Scott, Talbert, Taylor, Wilkie.

Besides the guides of the first day's excursion, Messrs. Baty and Doughty, who welcomed the company at Langholm, Mr. Davidson, secretary of the English Arboricultural Society, there also joined the party, and along with him were Messrs. Balden, G. Dodds, Johnston, Havelock, Hull, Ross, and others. Mr. Watt, of Carlisle, and party drove the whole way from Carlisle and back. Mr. Maxwell of Munches, and Major Dudgeon of Woodhouselee, also accompanied the party during the first day's excursion.

Besides most of those whose names have been already mentioned, there were present at Mr. Watt's breakfast, on the morning of the second day's excursion: Mr. Kennedy (Appleby Castle), Mr. Wilson (Greystoke), Mr. Kyrke (Anglesey, Wales), Mr. F. P. Dixon (Carlisle), Mr. W. I. R. Crowder (Carlisle), Rev. T. W. Anderson (curate of Stanwix), Mr. Tinning (Carlisle), Mr. Sutherland (Longtown), Mr. Greig (nursery manager, Knowefield), Mr. Ferguson (Knowefield), and Mr. Taylor (Knowefield).

Messrs. Brown and Fell, of Hexham, also joined the Penrith excursion, as well as Messrs. Rigg, Lonsdale, Mr. Robinson of Brown House, Torver, and others.

NOTES ON BRITISH ORCHIDS.

BY A. D. WEBSTER.

No. V.

Genus 9.—*Neottia.*—Distinguished as a genus from *Listera* by the brown stems with sheathing scales instead of leaves. Pollen masses two, powdery, glands connate.

Neottia Nidus-avis (bird's nest *Neottia*).—Root composed of a dense mass of thick, cylindrical, succulent fibres. Stem robust, over one foot in height, destitute of leaves, but clothed instead with several loose, sheathing, pale-brown scales. Spike rather dense, except at the base, and with a few distant flowers of a pale brown in every part. Sepals and petals incurved. Lip decurved, concave, and cloven at the extremity into two blunt, rounded, widely converging lobes.

THIS plant is supposed by not a few to be parasitic; but such is not the case, although the tannin and other matter of beech and oak leaves is certainly conducive to its growth, which may account for its being usually found beneath the shade of these trees. No doubt, the fact of this plant being found beneath the shade of the beech and oak, combined with its pallid hue and general resemblance to the *Orobanche*, has given rise to what has now become too well-founded, viz. that the plant is parasitic. But it is not so. The mysterious appearance and disappearance of this plant has also been frequently noted and commented upon, without any satisfactory explanation being given; but now that the nature of the plant and its peculiar method of propagation is fully understood, any little mystery is soon cleared up. The plant dies after flowering, but is capable of reproducing a new plant from the point of each of its fibres after they have become disengaged or fallen apart from the parent root-stock; the extreme point becoming rye or shool, which increases in size under ground till fully matured, when it pushes up vigorously, flowers, dies down again, and is reproduced in the same extraordinary manner. As the young plants never appear above ground until of a flowering size (which, I believe, requires five years), the appearance and disappearance of the plant is readily accounted for. As regards soil, the *Neottia* seems to prefer that of a stiff retentive nature, such as loam or clay; indeed, the soil in which it is generally found is so hard as to render the lifting of a plant uninjured a task that is by no means easily accomplished. The plant is incapable of cultivation, at least such I have found the case, and I am not aware that any one has been successful. By removing a plant with a good ball of earth attached, we have succeeded in getting it to perfect the flowering stem; but as regards reproducing its species, all attempts have hitherto proved of no avail. Under favourable circumstances the stem of this orchid attains a height of from twelve to fifteen inches, is thickest and strongest at the base, with a gradual taper upwards. Usually about one-third of the stem is covered with flowers, the whole forming a cylindrical spike, compact above but rather diffuse or irregular at the base, and of the same dull brown as all the other parts of the plant. This stem becomes stiff and pliable as it advances in growth, and continues in a perfect state for a long time after the seeds are shed—not unfrequently till the following spring. The popular name of bird's nest orchid is derived from the appearance of the root, the fibres of which are so crossed and entangled as to resemble in miniature a crow's nest.

Genus 10.—*Listera.*—Herbs with two sub-opposite leaves and small green flowers in a slender raceme. Anther two-celled, fixed by its base in a cavity at the top of the column. Pollen masses two, powdery, or the pollen very loosely cohering in the pollen masses.

There are two species, *L. ovata* and *L. cordata.*

L. ovata (two-blade *Listera*).—Root composed of numerous long, slender, cylindrical fibres massed together. Stem from one to two feet in height, bearing two large ovate-elliptical ribbed leaves placed opposite, and usually at some distance from the ground. Flowers in an elongated raceme, with minute bracts. Sepals deep green, ovate, and acute; petals lighter green. Lip yellowish-green, twice as long as the petals, and divided into two linear lobes.

Unlike the generality of our native orchids, the root of this plant is not formed of bulbs, but of a number of brownish clustered fibres that spread in a somewhat horizontal direction for three or four inches. The plant is very widely distributed, and in some places is so abundant as to become quite a nuisance. It seems to prefer rather damp woods, meadows, or pasture land, and usually a shady situation—the soil best suited to its perfect development being strong, damp loam. In this county it is very abundant, more so than any other species; the lawn at Penrhyn Castle being in some places, during the season, perfectly studded with its by no means beautiful flowers. The woodlands on the same estate are also well supplied with specimens, and I have noticed it in meadows and fields up to 500 feet elevation.

Generally this orchid does not exceed twelve or fifteen inches in height, although, under favourable circumstances as regards soil and situation, I have often met with it over two feet in height, one unusually large specimen measuring two and a quarter feet. The leaves are broadly ovate, from three to four inches in length by rather more than half that in width, placed opposite on the stem, and usually at a distance of half a foot from the ground. From the leaves downwards the stem is usually of a pale green or yellow, with a few sheathing scales at the base; upwards from the leaves the whole plant is of a bright green, unless when growing in very shady situations, when it assumes a paler colour. As a garden plant it is readily cultivated, but is more interesting as a botanical specimen than for any beauty of foliage or flowers that it possesses.

L. cordata (heart-leaved *Listera*).—Rootstock like the preceding, but always smaller, and usually less tufted. Stem four to eight inches in length, with two opposite, heart-shaped, acute, and slightly cordate leaves.

Flowers few and small, of a green colour, the lip usually tinged with brown or dull red; sepals and petals greenish-brown. Lip linear, bifid, with two teeth at the base, and of a greenish-brown or purple colour. Column without any hood-like appendage as in *L. ovata*.

This plant differs considerably from the latter species not only in size but shape and colour of flower. It is a native of mountain heaths, usually in boggy ground, where it seldom exceeds six inches in height, though more frequently three-fourths that size. The leaves, which are heart-shaped and slightly cordate at the base, are usually less than an inch in length, but very broad in proportion, and of the same deep green as *L. ovata*. Stem very fragile, angled, and surmounted by a few very small brownish-green flowers. This is in reality a mountain plant occurring in woods and moors, especially under heather, and sparingly distributed in a few such situations in England, Scotland, and Ireland. On the Dublin mountains, at 700 feet, it grows on *dry* heathy knolls, and generally under the shelter of the heather itself—information kindly furnished me by Mrs. Burbidge of the Trinity College Botanical Gardens. It occurs in one or two stations along the Pass of Nant Froncon, and near Llanrwst, both in Wales.

Genus 11.—*Goodyera*.—A small-growing plant, with ovate and petioled leaves. Flower-spike slender and somewhat spirally arranged. Lip not enveloping the column, as is the case in Spiranthes, with which genus it otherwise nearly agrees.

There is one species, *G. repens*.

G. repens (creeping *Goodyera*).—Rootstock branched, creeping, with a few short, downy radicles or fibres. Stem 4 to 8 inches in length, rather slender, glandular pubescent upwards. Leaves evergreen, acute, stalked, and of a deep green, occasionally speckled or marbled. Flower spike in spiral series, or one-sided as in Spiranthes, downy, and issuing from the centre of the tuft of leaves. The flowers are small, yellowish, or cream-white, and about a dozen on a spike. Bracts longer than the ovary.

In Britain, this plant occurs very sparingly, having only been found in a few Scotch counties, principally in the Highlands. It is an occupant of old mossy woods and forests, where amongst peaty earth and decayed pine pins it creeps about, although never increasing to a great extent. As in *Spiranthes autumnalis*, the flowers of the *Goodyera* are arranged in a onesided spike, which is tolerably compact near the point, but somewhat loose farther down. The leaves are placed on broad footstalks, which are stem-clasping, and usually crowded near the base of the stem.

A mixture of leaf mould, decayed pine pins, and sand will suit it well when introduced as a garden plant; but although under such conditions it flowers freely from year to year, it seldom increases to any great extent. Although somewhat rare in Britain, this plant has a wide geographical range, being found in moist woods in Northern Europe, Asia, and America. It flowers in July and August.

Genus 12.—*Spiranthes.*—Rootstock composed of tubers or stout fibres. Flowers small, in a more or less spirally-twisted spike. Column arching, with the anther hinged on to the back. Pollen masses four, sessile on one linear gland.

There are three species, *S. autumnalis*, *S. Romanzoviana*, and *S. æstivalis.*

S. autumnalis (common *Spiranth*).—Root of two or three brownish, oblong, downy tubers, and producing several radical, ovate, rather glaucous leaves. Flowering stem issuing from the side of the tuft of leaves usually about 6 inches in length, viscid and downy. Flowers arranged in a close half-spiral spike, small, white, and fragrant. Sepals and petals half erect, and uniting in a close hood over the lip. Lip channelled at the base, with the tip crenate.

A very pretty but small species of *Orchid,* that occupies dry, hilly pastures and downs, where, from August to October, its deliciously fragrant flowers may not unfrequently be seen in considerable abundance. The root of this orchid is composed of from one to three oblong or cylindrical tubers about 1½ inches in length, rough or downy, and with a very few fibres. From these proceed what may be best described as a tuft of rather small, oval, spear-shaped bright green leaves, that seldom exceed 1 inch in length. Alongside the leaves rises up the flower-stem to a height of 6, to sometimes, in very favourable situations, as much as 8 inches, with three or four spear-shaped pointed scales which embrace the stem. The flowers are arranged in a singularly spiral spike about 2 inches in length, all diverging horizontally to one side and in a single row, while the bracts remain erect on the opposite side. In England it is fairly abundant from Westmoreland and Yorkshire southwards to the Channel Islands. It is also found, though not plentiful, in some parts of Ireland.

S. Romanzoviana.—Rootstock composed of two or more fleshy, cylindrical tubers, each from 2 to 3 inches long, and tapering very slightly downwards. Leaves broadly lanceolate, usually five or six, ribbed, and clasping the stem. Flowers white, not unlike those of *S. autumnalis*, but much larger and broader, arranged in three rows, and forming a rather dense, ovate spike of from 2 to 3 inches in length. Bracts *smooth*, not hairy. Sepals and petals uniting in a close hood over the lip. Lip tongue-shaped, recurved at the tip, which is also slightly crenate, contracted in the middle, broader than in any of the other species, and almost pure white. The flowers are deliciously flagrant.

Rarer even than the latter species, this plant has but one British station—a little meadow on the north side of Bantry Bay, near Castletown, in the south of Ireland. It is unknown elsewhere in Europe, but extends from the Atlantic to the Pacific in North America, its range, as given in the *Report of the Geological Exploration of the 40th Parallel*, being "Maine and Canada to Lake Superior, the Saskatchewan and Washington Territory; northward to Unalaska, and southward to California and Colorado. East Humboldt Mountains, 6000 to 8000 feet, July—Sept." This pretty flower is now almost extinct in its Irish station, the place in which it grew having been drained and cultivated by its owner some years ago. Grant Allen mournfully says: "The ardour of modern botanists is fast putting an end to its brief career," and then adds: "This case presents some features of peculiar interest, because the Irish specimens would seem to have been settled in the country for a very long period, sufficient to have set up an incipient tendency toward the evolution of a new species; for they had so far varied before their first discovery by botanists, that Lindley considered them to be distinct from their American allies; and even Dr. Bentham originally so classed them, though he now admits the essential identity of both kinds." The questions, Did it ever occupy other European territory, and did it migrate from America, or was the current in the opposite direction? are well worthy of consideration, and have already received attention; for the latter writer affirms his belief that the seeds were carried across the ocean by chance at some remote period, and Professor Gray will have it that "these are merely the last, or among the last, lingering stations of a species once common to both continents." Apart from its singular geographical distribution, this little plant has much to recommend it, for the white and deliciously fragrant flowers, arranged in a spiral spike, are both effective and interesting. It may be successfully cultivated; for Mr. Burbidge, of the Trinity College Botanic Gardens, Dublin, informs me that he grew and flowered it well for some years. Cold, damp bogs, in usually upland situations, are the favourite haunts of this interesting plant, and where, during the months of August and September, its rather inconspicuous though deliciously fragrant flowers (violet-scented) are to be seen.

In the south of Ireland this rare orchid is best known by the name of *S. Hibernicus*, information kindly furnished me by M. E. Gumbleton, Esq. of Belgrove, and to whom I am also indebted for living specimens of the plant.

(*To be continued.*)

THE FORESTRY COMMITTEE.

THE Select Committee of the House of Commons, appointed on the motion of Sir John Lubbock, to consider whether, by the establishment of a forest school or otherwise, our forests can be rendered more remunerative, took evidence on Tuesday and Friday, the 21st and 24th of July, Sir John Lubbock being chairman.

The Chairman had received a communication from Lord Powerscourt, who was unfortunately abroad.

Mr. W. G. Pedder, Revenue Secretary, India Office, stated that the Indian Forest Department was first established about forty years ago, previous to which the forests were under the ordinary law. A department was authorized in Bombay in 1846. A year later a similar step was taken in the Madras Presidency. In 1864 an Inspector of Forests was appointed, and from that time systematic inspection began. At first the forest revenue was about £40,000. Since then it had risen to a nett revenue of over £400,000, and a gross revenue of nearly £1,000,000. Undoubtedly that was due to the increased education of the forest officials. Originally the department in India was selected from men who knew something of the subject of forestry, and who were connected with the military or naval department. The Indian Department obtained an instructor from France, and since then they had sent men to study forestry at Nancy. An inquiry was made as to whether the woodlands in England and Scotland were so managed as to be a suitable training-ground for students for India, and it was found that they were not so managed. It was found that the young men sent to France were not sufficiently well acquainted with the French language to acquire knowledge through that medium. A change had consequently been made. The young officers selected were sent to undergo a course at the Royal Engineering College at West Hill, where they were instructed in the ordinary engineering education, and in addition were taught forestry and botany and forest law and jurisprudence. Forestry would be taught as much as possible in the forests near the college. Students would then go to the French forests. The course would take two years. No applications had been received for other than the Indian Department, but no doubt other students would be received, who would pay the fees of £180 a year, including everything except pocket-money. The system of training the superior and inferior grades was quite distinct. The inferior grades could be filled by natives, but it was desirable that all the superior departments should be filled by Europeans. From

1867 to 1885 the competitors for superior forest service were 511, all Englishmen, or Scotchmen, or Irish. Thirty years ago there was hardly any attempt at conservation of forests. Faith was placed in the natural reproduction of forests. The demands of the railways and of the great cities had created an immense demand for wood. Now, about 48,000 square miles had been brought under systematic cultivation. Besides that, some of the smaller states, such as Travancore, had themselves established forest departments. In the Indian forest schools instruction was given in English and in the vernacular. The course was for eighteen months, and included forestry and forest law, chemistry, botany, geology, etc. There was no fee. Students were educated at the expense of the Government. The students were limited to those who desired to enter the Indian Forest Department. No doubt private persons could send students. The second class was the vernacular class, who were not supposed to know any English. They were taught the influence of soil and climate, elementary surveying, etc. In the forest they were taught felling, pruning, making of charcoal, insect-destroying, and in fact the work of a forest. Last year there were forty-six men in the school in both classes. A number of applications had been received for proper forest officials, not necessarily Englishmen; but they had generally been able to recommend Englishmen for the upper departments. There might have been a Frenchman appointed in Cyprus to supersede the Englishman, who had gone back to India. He believed that Col. Pearson had said that when he was applied to, he was obliged to send foreigners; but that was in his private capacity. The Indian Department sometimes recommended foreigners. The staff of the Forest Department in India of the superior grade now numbered about 150.

By Dr. Lyons: The principal causes of destruction were trespass, the claim for free wood, and forest fires. Speaking roundly, the area cultivated in Bombay had extended from 12,000,000 to 20,000,000 acres. A great deal of that might have been reserved for forests. The natives claimed rights as to grazing cattle, etc. When the railways began, permission was given to go into the Government forests and cut down timber. The cutting down and taking away of one tree by unskilled hands frequently destroyed about twenty trees. Roads had been cut and fire breaks had been made to guard against the fearful forest fires. £935,000 was received in gross from the forests. The charges were £567,000. Asked how much of this went to the extension of forests, he said about £75,000 was spent last year. Agreeing that a fourth or a fifth of a country should be given up to forest, there was only a tenth of India so given up. There ought to be 140,000 square miles, but there was a very large proportion of the country not available for forests, unless the people were expatriated. A thing that destroyed forests more than anything else was grazing. When the trees got beyond the stage of being injured by cattle, grazing was a very valuable adjunct. The cattle were exposed to great risk from forest fires. The department made it worth while for people to put out fires for the sake of reward. One forest path in Scinde was 174 miles long and 100 yards wide. A considerable number of the population was employed as forest guards.

Dr. Lyons stated that during the Franco-German war the forestal service of France furnished 7000 volunteers.

Witness agreed the number of persons employed in forestry in India would not be less than those in France. Some of the natives had suffered from the deprivation of forestal or customary rights in the forests, and it was doubtful whether the wages they received would compensate them. On the other hand, they were undoubtedly destroying the forests, and depriving themselves of their own means of livelihood. The forests in India were on the whole paying their way, and the revenue was increasing year by year. It was well known in India that the denudation of forests had an effect on the water supply. In the North-West Provinces the denudation of forests had led to the washing down of immense quantities of sand. In a portion of Bombay the people complained bitterly of the decreased product of the rice lands, which he attributed to the denudation of forests. India was dependent on wood for fuel, and therefore the supply of wood was of the greatest importance. The effect of the establishment of a forest department had been to raise the price of wood. On the other hand, the department ensured a wood supply for future years, which, but for their action, would not exist. Materials were also supplied for architecture and furniture.

By Mr. Seely: A teak forest ought to have a rest of about forty years. One of the principal points with which a forester had to deal was the period at which the timber should be cut.

By Dr. Farquharson: A great variety of trees were grown in India—largely the pine. He did not suppose the authorities at Windsor would allow that the royal forests in England and Scotland were not scientifically managed, but it was the opinion in India that they were not. It required a great deal of scientific knowledge to establish a forest on the system of natural reproduction.

By Mr. Seely: The forests in India were divided into blocks, and on these a system of rotation of crops of timber in twenty-five or forty years was practised. A forest generally consisted of one kind of timber, say teak, with a quantity of undergrowth.

Col. Nolan asked what would be the effect on Ireland of the planting of 5000 square miles of forest on the 32,000 square miles in Ireland? Witness said about twenty directing men would look after that extent of forest in India, and about three hundred other men. He could not say what would be the climatic effect on the country.

By Col. King Harman: At first the foreign foresters who went out were half French and half German; but it was thought the Indian forests were better suited to the French than to the German system.

Asked if forest blocks must not be all of the same kind of timber, witness said that some of the best examples of forest cultivation in India were those of mixed forests.

By the Chairman: In a forestal growth for 150 years, the forest might be open for pasturage about seventy-five years. Nobody knew the actual value of the Indian forests, but the value had increased very much in the last twenty years. It was objected to the Englishmen who went out at first that they were ignorant of the first principles of forestry.

Col. Michael, C.S.I., examined by Dr. Lyons, stated that he was at the inception of the forest system in India, and especially in the Madras Presidency. It originated through Gen. Frederick Cotton about 1848. General Cotton, riding through the forests, was very much struck with the manner in which the forests were being overworked through the Government system of leasing. The General conferred with him because he had paid some attention to forestry, especially in Switzerland. He knew the slide on Mount Pilatus, and the shoot at the Falls of Gleisbach for the removal of timber. Excellent results were produced in India within seven years of the establishment of the forestal system. The first forest he got in charge was fifty miles long. Other forests adjoining were leased by the Government, in order to enable him to carry out his system of roads and tracks. No planting was done in his time in the forests under his care; planting had been done since, and had been most successful. Mr. Connolly's exhibits at the Edinburgh Exhibition showed what had been done in thirty years. There were now 3500 acres in Malabar, planted entirely in teak. The plantations paid very well from the thinnings. It was put into the public market, where there was great demand for it. The principal cause that led to the destruction of forests in early days was that they were in nobody's charge—people turned in their sheep and cattle. Teak contained an essential oil that rendered it of great service in resisting water and iron-rust, and it was therefore of great use in ship-building. Specimen logs sent to the Edinburgh Exhibition were worth 6s. per cubic foot. He was told there was no timber in the world equal to teak to be put behind the armour of ironclads. It was also used for backing targets. Many Indian timbers besides teak would be remunerative in the English markets. He had seen the effects of denudation of forests. He had seen a stream entirely dried up from that cause. The wood which surrounded the spring was cut down, and there was no water there at all now. The planting of a forest would not produce a spring,—at least he could not mention an instance. He considered that a school of forestry in this country would be of immense value, especially to the proprietors of woods, who would then have better trained men than they could get now. He knew that the proprietor of Blair Athole had difficulty in finding suitable men to manage the forest. In 1883 there were £647,000 worth of teak imported into England. Forest products in resin, charcoal, etc., were extremely valuable.

By the Chairman: He was glad that the young men were to be trained in England for forestry rather than abroad, where they did not understand the language sufficiently well. He considered there was great need for improvement in the management of English forests. The establishment of a forest school in this country would have very beneficial effects.

By Dr. Farquharson: There was no country where arboriculture was better understood than in Switzerland. The eucalyptus and acacia had been introduced into India from Australia with great success. There was a great deal of waste land in Ireland and the north of England that might be forested with advantage.

Dr. Cleghorn, who took an active part in the formation of the Indian forests in Madras and the Punjaub, was the first witness examined on the 24th July. He concurred generally in the evidence already given on Indian forestry. He had no doubt that were a forest school established in Edinburgh, all the branches could be well taught, from the educational advantages which that city possessed; and access to all classes of woodlands was readily available from it. One of the largest forests in Scotland was that of the Duke of Athole, which was many miles in extent. Mr. Adam, M.P., before leaving for Madras, had publicly insisted on the special advantages of Edinburgh for the site of a forest school.

By Dr. Lyons: Great Britain and Ireland were backward as compared with European countries in sylviculture, but not in arboriculture. Commercially immense benefit would result both economically and otherwise from the better management of the forests. The acreage under forests in the three kingdoms was excessively small as compared with the forests of France, Germany, and other parts of Europe. Without a forest school he did not see how any improvement was to be made. Various steps had been taken in that direction in Scotland, where a museum and library with this special object were being established. There should be forest schools in England, Scotland, and Ireland. These schools had existed on the Continent for a considerable time. Some of those in Germany had existed 100 years. Most certainly there should be a forest school in Edinburgh. An elaborate system of scientific education was given in Germany as a groundwork for special forestal knowledge. He had read the paper by Mr. Simmons at the Society of Arts, giving statistics of the annual importation of timber to the amount of £17,000,000, or with resin, etc., £31,000,000. With the existence of a forest school, a material proportion of timber might be supplied at home. At all events, we could do a great deal more than we did at present. Better scantlings of timber might be grown by careful management. This country could not depend much in future on the Indian supply, on account of the great distance. Teak was of exceptional value. All the foreign possessions of England were taking up the subject, more or less. Indian forest officers were lent to the Colonies as a favour. Supplies of timber from Canada were very considerably diminished. Prince Edward's Island, which was once covered with timber, was altogether denuded. Asked if England must expect a diminished supply, witness said there was no doubt of that. A considerable part of England, now lying unproductive, would grow timber better than anything else that could be suggested, especially on the banks of navigable rivers. He knew Scotland very well, and he considered that a greater area than the three-quarters of a million acres in that country devoted to timber might be usefully applied in that way, especially on the seaboard. There were great slopes of land in the North of England which were now comparatively waste, and which would grow timber on a large scale. As a matter of shelter and rainfall, forestation was valuable. There was a general consensus among the chief forest authorities in Germany, that from a fifth to a fourth of a country ought to be under forest for the well-being of the rest of the country. After a lifetime devoted to the cultivation of forests, he concurred in that opinion as a general rule. It was also generally understood that a process of denudation of land was generally going on to a very serious extent where the country was disafforested. In Spain, Italy, and some other countries, the denudation was most serious. In this country ornamental woods, though small, were of some service. The quantity of timber standing in England was comparatively limited, only 1,466,000 acres. In France the amount was 22,000,000 acres, in Austria 23,000,000 acres, and Hungary 22,000,000 acres. Scotland had about 750,000 acres. Ireland had 350,000 acres, which was 40,000 less than that country had in 1841. A very considerable amount of cutting down was going on in England, Scotland, and Wales, without any corresponding extent of reproduction. In Scotland during the last century they had paid great attention to the cultivation of woods. In face of the state of things he had mentioned, it was an important matter that the reafforesting of the country should be considered. Besides the timber, which was so important in architecture and handicrafts of every kind, there were many industries connected with bark, tar, resin, and undergrowth. A great deal more could be done in utilizing fragments. He understood that Cumberland timber was largely employed in the production of iron and steel. Charcoal-smelted iron stood very high for the production of the best quality of steel. He had had great experience of the extension of the forestal system in India. When camels, goats, and cattle were excluded, the forests reproduced themselves. The department planted teak seeds and those of other trees on cleared spaces after forest fires, etc. The reafforestation of suitable lands in this country would give occupation to many suffering from want of employment of labour.

The Chairman: You do not say that a forest would give more employment than agricultural land?—Witness said he understood that the question he was asked had reference to land unsuitable for agricultural operations.

By Mr. Seely: It would be better to get one good school for the three kingdoms first, and then when that was full, to try another.

By Dr. Farquharson: There were very good practical foresters in Scotland, but they had not been taught vegetable physiology. Three or four of them had been employed in India for planting. They had had no school to go to for theoretical knowledge. In France and Germany they do not plant much, but leave restoration to nature. The Scotch were exceedingly good planters, and if they had a little more theoretical knowledge they might turn their natural sagacity to better account. He hoped that forest schools might become self-supporting. It was a question as to what the owner of the woods could afford to pay. Of course, a forester who only received £60 a year could not pay much. As to planting more extensively in Scotland on mountain slopes, he guarded himself by saying these should be in accessible places near rivers. Asked his opinion as to planting grouse moors, witness said smilingly he would rather not say much on that subject. If a much greater area was put under wood in Scotland, it would depend on the foreign supply as to whether that would bring down prices.

The Chairman asked whether the keep for sheep would not be so much better in woodlands than in the open moors that the thirty years' pasturage out of a hundred would pay ?—Witness said he had not formed an opinion on that point.

By an hon. Member: A great deal might be done by selecting foreign timber suitable for our climate. The larch itself was a case in point. It was a foreign tree, and was one of the most valuable now grown.

By another hon. Member: He was aware that the land on the banks of navigable rivers in this country was generally valuable alluvial soil. Asked if there should not be some concession made in the way of taxation and tithe to encourage planting, witness admitted that the experiment would be rather perilous without some such concession. Larch generally did well, and so did the ash. Coniferous trees were the most profitable in France. Teak would not grow here. Osier beds, sycamores, and poplars would do.

Col. Pearson, who had charge of the Indian students at the forest school in Nancy, generally concurred with the evidence already given. He was strongly of opinion that the more scientific training of the Indian forest officials had a great deal to do with the increase of the forest revenue, and he had no doubt a similar effect would follow forest schools in this country. There were not more than two or three forests in France where oak could be grown to advantage. It made a great difference to a forest as to what classes of trees were in association. A great part of the New Forest was going to wreck and ruin. The Indian establishment was frequently applied to, to send competent forest men to the Colonies. They were frequently obliged to send Frenchmen. The French schools, though useful, were not quite suited to Englishmen on account of the language, the difference of technical terms, and also political differences. The French school was, however, an admirable one, and we were indebted to it for the able men who were carrying on forestry. The education was expensive and exclusive. Asked if the arrangements suggested at Cooper's Hill would suit the requirements of the English owners, he did not think they would. Any education given in England should be sufficiently economical to enable wood managers and bailiffs to take advantage of it. If a man got three or four months' forestal education in each year for two years, he might acquire a good deal. General education in this country might be supplemented by special forestal education at museums and in forests by those who required it. King's College and University College both seemed to give facilities for general education. Forestal botany might be carried on with the other education. A forestal chair might be established in Edinburgh; but in all cases it would be necessary to take the students to the woods.

There was enough forest in the New Forest and the Forest of Dean to illustrate lectures on scientific forestry.

Mr. Thiselton Dyer, of Kew, advocated a knowledge of chemistry as essential for the extended cultivation of forests. In France, private woods were much in the same state as in England: in both, skilled foresters might initiate most profitable improvements. The picked men sent from Kew Gardens to the Colonies to give directions on forestry had generally been successful. Asked his opinion as to the steps that should be taken with regard to this country, he thought that India, where they had every advantage for study of forestry, should be made the nucleus of forest education. A week spent in a properly-worked forest was worth a month of lectures.

Mr. Julian C. Rogers, secretary of the Surveyors' Institute, concurred with the previous witnesses as to the general advisableness of instituting a forest school both for this country and the Colonies.

The Committee will not sit again this session, but have reported to the House that another Committee should complete the inquiry. The House of Lords has sent a message to the House of Commons requesting to be furnished with a copy of the evidence.

The evidence has (August 22) now been published; our report is condensed chiefly from the *Field*, and revised by a witness.

LABOUR-SAVING APPLIANCES.

(*See page* 262.)

Common Roofing Slates have hardly been appreciated as a help in raising vines from cuttings out of doors. We place the rows of cuttings one foot apart, covering the ground solid between them with slates. These draw the heat of the sun, causing an immense network of roots to run close to the surface under the slates, keeping the ground warm, moist, and mellow; they also do away, in a large measure, with the expense of weeding and cultivating. When cuttings are planted behind slates set at an angle half way in the ground so as to catch on their faces the full rays of the sun, they throw out a mass of roots; while the young bud which starts is shaded from the direct solar rays.

The Weed Annihilator of Mr. Jenkins is a half-circle of a boiler, or heavy sheet-iron 12 feet or more in length, with a draft chimney at the farther end, and is designed to burn the weeds over a space 4 feet wide, and along its full length. It is then drawn forward on runners or iron trucks, when the operation is repeated. And thus a large surface of weeds can be burned over in a short space of time.

LETTERS TO THE EDITOR.

OAK-PLANTING.

SIR,—I have much pleasure in answering your correspondent "W. S. O." (May number, p. 62) regarding the above, in the rotation in which his nine queries occur.

1. One bushel of acorns to 25 feet in length of a 4-feet wide bed. Cover $1\frac{1}{2}$ inches with free loose soil.

2. Two years.

3. Yes. About one-half, much depending, however, on the growth of the plants, whether luxuriant or not.

4. Two or three years. Three to four feet.

5. Yes, straggling side branches or rival leaders should be pruned off when noticed.

6. Yes.

7. This plan is preferred by some, but we always advocate pruning with a sharp instrument. Yes.

8. Yes, if they require it. See answer to No. 5. Yes, unpromising oaks in the nursery border frequently turn out well when planted permanently.

9. Not generally. They will be all the better of a couple of years' training in the nursery. A. D. WEBSTER.

PENRHYN CASTLE, NORTH WALES.

THE BLADDER-NUT TREE.

SIR,—Am I right in naming the enclosed spindle tree. It has been the cause of a considerable amount of discussion amongst gardeners, etc. in the garden where it grows. The bush stands about 18 feet high, growing in what may be called alluvial soil in the valley of the Wye. Numbers of our laburnums and bird cherries have suffered very much from the drought, and I am afraid some of them have been killed outright. The foliage upon them is completely dried and shrivelled up, and they present a mid-winter appearance. G. D.

[The specimen you send, not a very good one, is one of *Staphylea pinnata*, the bladder-nut tree. The height mentioned by Loudon as that to which the tree generally grows is from 6 to

12 feet high; so your bush must be exceptionally flourishing. The flowers are said to be very attractive to bees from the honey they yield.

Lancaster appears to have suffered severely from the drought of July to whose very exceptional character Mr. G. J. Symons has called attention in the *Times*. Our Hants correspondent writes in a similar strain.—Ed.]

TRIPLE CROPS FROM THE SAME GROUND IN A YEAR.

SIR,—In the agricultural returns for this year there is one piece of land in Buckinghamshire which returns two crops from the same land. It is now being put under its third crop. It is a field which has for seventeen years successively yielded mangold-wurzels; crops ranging from 20 to 30 tons per acre. Last year it had cattle-cabbage planted between the rows of mangolds; some of them now weigh from 10 lbs. to 16 lbs. each.

With this year, with the mangold-seed, white turnips were drilled on, and have yielded plentifully of fine turnips without interfering with the mangolds, which are a promising heavy crop. I am now planting three thousand cattle-cabbage per acre which, being sheltered by the mangold leaves, do not welt in the hot sun. When the mangold crop is pulled in November, the cabbage will have all the ground to itself till next February, and be serviceable for cows and ewes.

As cattle-cabbage plants are only 3s. per thousand, it is a cheap and ready crop to get in.

J. C. King,
Agent to his Grace the Duke of Somerset,
Bulstrode, Slough.

A MISTAKE CORRECTED.

SIR,—The June issue of *Forestry* contains a list of German and other Forest Periodicals; but the oldest Forest Journal of the Continent, "*Allgemeine Forst u. Jagdzeitung* (*gegrundet* 1826), herausgegeben von Prof. Dr. J. Lehr in Munchen u. Prof. Dr. T. Lorey in Tubingen," is not mentioned. How is this?—I am, etc.,

Forest Assistant.

[An overlook.—Ed.]

OAK-GROWING.

SIR,—Have you ever had any discussion or paper in *Forestry* on peeling oak standing, and leaving it for felling until the winter? It is advocated, I believe, by some, but does not appear to me practicable, except for a few solitary instances under or for exceptional circumstances. How long should an oak tree after being peeled be left standing before being felled as seasoned timber? Does timber gain much towards being seasoned and fit for use when left in the round? I fancy myself, there is little gained towards seasoning until it is quartered or sawn into planking. If you could, through your paper, raise any information or experience on the above points, they would be both interesting and instructive. —Yours faithfully, HENRY DOUNE.

LEEK-WOOTTON, WARWICK,
20*th August* 1885.

[We admit the above, though just closing up our space; we defer our own remarks till next month. Will one or two readers also correspond on one or other of the topics started?—ED.]

SUTHERLANDSHIRE FLORA.

SIR,—Would you kindly publish in your September issue of *Forestry* the common and botanical names of the enclosed specimens of trees and shrubs picked up in the county of Sutherland by WANDERER.

August 17*th*, 1885.

[We object to naming more than six specimens in any single issue, especially when, as in some instances in the present parcel, only scraps of leaves without flower and fruit are sent towards the close of the month, when we are in the hurry of preparing for next issue. Send better specimens of Nos. 1 and 2. No. 3, *Acer criticum,* maple. No. 4, *Platanus orientalis,* Oriental plane. No. 5, *Alnus glutinosa,* alder. No. 6, *Abies Morinda,* the Himalayan spruce; usually attains a height of about 50 feet, but attains to from 80 to 120 feet under favourable circumstances, grows in its native habitats at from 7000 to 10,000 feet above the level of the sea. No. 7, *Pinus Aristata.* The bearded-scaled pine, found on Pike's Peak, in snowy mountains of North America; said to attain a height, when fully grown, of from 30 to 50 feet. No. 8, *Abies Parryana glauca,* glaucus spruce fir. No. 9, *Juniperus Chinensis aurea,* the golden Chinese juniper. No. 10, *Azalea pontica.* No. 11, *Polygonum Sieboldi.* No. 12, *Daphne pontica.* No. 13, *Solanum Dulcamara,* bitter sweet. No. 14, *Syringa Persica,* the Persian lilac. No. 15, *Rhamnus,* sp. No. 16, *Cornus mas.,* Cornelian cherry. No. 17, *Cratægus,* sp., may be whitethorn; send more complete specimens. No. 18, *Euonymus Europæus.* Our readers will thus see the state of vegetation in the far-north of Scotland during this August.—ED.]

POND-CLEANING.

BY J. CHARLES KING, BULSTRODE, SLOUGH.

PLATE V.

THIS, a very essential labour of every farmer desirous to keep his stock healthy, when rain is scarce and springs low, is often delayed; and when done, the water is often wasted so as to be unavailable for the use of stock. The men usually shovel the mud on to the bank when they are near enough it to do so; but when they proceed towards the centre of the pond, warps have to be made, and the mud is deposited on the edge by successive throwings; or it is wheeled out by wheelbarrows, where the pond sides slope so as to prevent the use of carts and horses. In the latter case, I use a simple mud-derrick of my own contrivance, easily rigged up by a farmer having a strong timber-gig or waggon wheel, with the large boxes or bushes used for wooden arms. In the accompanying illustration may be seen the turning-post in the wheel, the square frame bolted on to the post, to carry the crane-gear with its cog and pinion wheels, with stop-clutch, and two handles for winding up and down.

The yard-arm, or head of the derrick, has two pulley-wheels let in, over which the rope passes, and diagonal brace-stays of wood and iron secure it to the post.

The mud-bucket, A, is a square tray, wider at the open end to allow the mud to slide out easily; two of these are used, one being filled, while the other is being emptied into carts standing at the edge of the pond; the rope being unhooked and hooked to the tray each time. A hauling-line is shown at the end of the arm; the derrick with the tray is thus pulled round with the arm over the pond or the cart. The tilting of the tray to slide the mud into the cart is done by a man standing on the cart shafts in front, with a scrape in his hand to clear the tray. If plenty of line is used, the trays may be filled in the middle of a pond one hundred feet across, and drawn up to the derrick by the winch. A trayful of mud weighs about 2 cwts., so that two men are wanted to wind it up. When a portion of the pond has been cleaned out, the derrick is turned down and wheeled to a suitable place for fixing up again; the wheel is held down by four or five long iron dogs, driven into the ground, which clip over the felloes of the wheel.

Such is the machine; but if not used methodically, it will not save the expense sought for.

Thrift in management is not an agricultural virtue, as the following calculation in time of men and horses wasted at such a job as mud-carting will prove. By the simple arrangement of never having a horse, man, and cart waiting while the cart is being filled, nineteen working days of seven hours a day are saved on four hundred loads of mud, as may be estimated from the following data. It requires twenty minutes to fill a cart with mud, which amounts to nineteen days for four hundred loads. A standing cart for loading into, saves this waste; two or more, if there is room, are better still, as they can be filled overnight. The water, draining away, makes the loads lighter, and the teams move off at once in the morning, instead of waiting two or three deep and wasting time which cannot be got back by hard driving.

Farmers who run short of water, may not be aware that by leaving say forty yards of mud at the bottom of a pond, it fills up what might be replaced by nearly seven thousand gallons of water in the same space.

DRY SILOS.

BY JOHN CHARLES KING, AGENT TO HIS GRACE THE DUKE OF SOMERSET, BULSTRODE, SLOUGH.

OTHER materials than green food considered unfit for cattle food and used mostly for litter, such as straw, fern, etc., may be packed in the dry silo. Rye-straw thus treated in a proper fashion makes an ensilage which all stock like, and is a specially excellent fodder for cows in milk and lambing ewes. Old chalk pits with deep sides, a close-sided shed or building may be easily turned into such a dry silo, or the open stack plan would serve. A silo can be made in the bay of a barn by boarding up the midsty as high as the beam, with stout plank well secured, and battened across. The process is as simple as it is old amongst sheep-farmers of Essex and the eastern counties of England. The material, cut as short as possible, is carried, say, into the barn, where a number of men and boys, each with a wooden rammer in each hand, ram and tread it hard; also finely-powdered salt is scattered over it to the extent of about 1 lb. to the cwt. of chaff; while water from a fine rose is at the same time gently showered over it. In warm weather, and with dry chaff, a gallon of water to the cwt. of chaff is used. When the chaff rises in the barn, use only half this quantity of water. The whole mass of chaff treated is every night levelled at top. Heavy planks are laid on, at each filling and settling, to compress it. I use chains fixed to staples in the barn floor; by fixing a screw jack to a link and taking a bearing on the planks, extra pressure is obtained. So hot does this chaff become after a few days, that the hand cannot be comfortably held in it. It will have cooled down in six or seven weeks, assuming a black bronze colour, with an aromatic fragrance; it is then fit for use. It has to be opened at the under side; an American hay-knife being useful for cutting into it. If well covered down, it may be kept for two or three years.

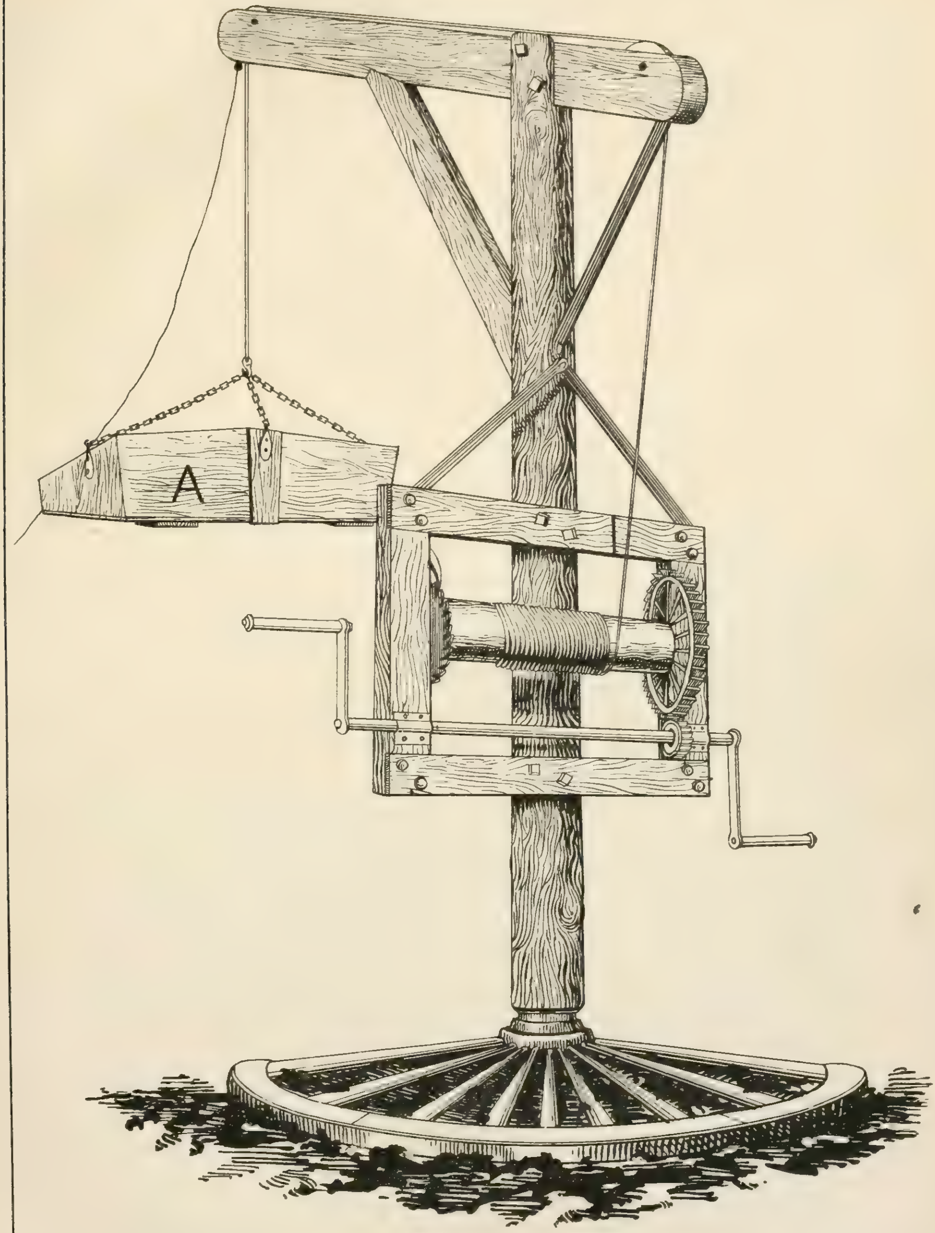
Waste hay, old malt-dust, fern, lawn-mowings, as well as leaves of mangold-wurzel, pea-hulm, tare-straw, when cut short and added to the matter packed in the silo, increases its appetizing flavour.

Rye, besides being thus used in the dry silo, when early sown in August, can be sheep-folded; it may be then in early spring cut green for stock; afterwards a good plant for seed may be had: so we may count four crops from a plant that grows on poor soils and seldom fails.

BUDDING.

THE following is part of a paper read before the American Association of Nurserymen, by Mr. N. H. Albungh, of Ohio:—

The Best Method.—The "wise man" has said, "There is a time for all things;" and nurserymen find the minutiæ of their occupation no exception to the rule. Budding is now practised, generally, by nurserymen for all kinds of fruit trees, except the apple, and even there, budding is growing steadily into favour. To secure success in budding, first, the stocks must be healthy, hardy, and of good size. Foreign stocks, for the pear, cherry, plum, and even apple, are generally preferred, though good, healthy native stocks often do as well. The best stand of budded apple I ever saw was upon first-class imported crab-apple seedlings. In planting out the



McLagan & Cumming Lithrs. Edinr.

stocks (which is generally done with the spade), great care should be taken to press the earth very firmly against them. A very slight shortening in of the top, as also the tap root, is generally practised. Rich black loam is not the best ground for nursery stock, and, on the other hand, thin and soggy clay land is alike unsuited for the growth of trees. The latter, however, can be made available by thorough underdraining and manuring. The very best soil is a friable loam, largely of clay, naturally dry or well underdrained, and placed in good heart by liberal applications of well-decomposed barnyard manure. If the enriching matter can be applied a year or two before planting the stocks, so much the better.

Time of Budding.—Stocks are generally budded in the following order: apple, pear, peach, plum, cherry. In the Miami Valley, beginning with apple about first to tenth of July, we follow immediately with the pear, then the peach about August 1st, and plums and cherries from August 15th to September 15th, according to season. Successful union of the bud with the stock depends, principally, upon the condition of the sap at budding time. Should you find the sap thin and watery, as will sometimes happen in rainy seasons, better wait a week or ten days, until the sap or inner layer of the bark becomes somewhat thicker. A careful watching of the stocks will readily determine the proper time for the work. Removing the wood from the bud is now generally practised, in all except cherries, though some nurserymen cling to shield budding throughout. The skill and deftness of the budder has much to do with the success of the operation, never forgetting that tying in the bud closely and neatly is of equal importance. The bud should be cut long enough, particularly above the eye (an inch at least), and slipped into position with as little injury to the inner bark of the stock as possible. Bass bark, matting, and like materials, are generally used for tying. Of late years we have used cotton warp, and find it preferable to all other ties, particularly in cherries; it draws the bud firmly and snugly into position and retains it securely, without any danger of becoming loose. In cutting off the stocks the following spring, the general practice is to cut down at once to the proper point (say about an inch above the eye of the bud), and make no further cutting, except to keep down the suckers from the seedling stocks. In event of dry weather and chilling winds, after thus cutting off the stocks, the sap may not rise in its full strength to the top of the stock, and in this way the bud be weakened. A better plan seems to be to use a pair of long-handled clippers or shears, with short, hooked jaws, and cut off the stocks about 6 inches above the bud.

REVIEWS OF BOOKS.

NEW CROPS FOR OUR OLD LAND.

How to make the Land Pay; or, Profitable Industries connected with the Land and suitable to all Occupations, large or small. By HENRY P. DUNSTER, M.A., Vicar of Wood-Bastwick, Norfolk. London: Longmans, Green, & Co.

WE noticed in our number of last November the protest by this reverend author, just then published in the *Nineteenth Century,* against the great sum annually drawn by foreigners for articles of farm produce which might be grown within our own borders were England turned into a market garden. The present volume of 230 pages enlarges on the theme, and is planned so as to overtake the various items enumerated in the table we published from the Board of Trade returns. The diversion of the £38,000,000 or so, annually abstracted from John Bull's pockets, back into those of the cultivators of his own acres, would surely ensure attention to this book. But it has other recommendations. The author combines the *rôle* of a university man with one who has long lived amongst rural surroundings, besides having by travel been specially qualified to discuss the items under review. As already hinted, the book covers a wide range of topics. Dairy and poultry farmers, rabbit rearers, curers of ham and bacon, fruit and flower farmers, bee-keepers, and fish-breeders have all special chapters. And in such a plethora of interesting matter, all coming within our scope, we can only meanwhile call attention to other discussions of industries perhaps connected most directly with the vocation of our readers.

In the chapter on filbert-growing, the labours of Mr. Cooper of Reading are fully recognised. On a well-sheltered hillside, for instance, £100 a year may be made from an acre cropped with first-class cob-filberts after the first five or six years. Indeed, security of tenure is a necessity for filbert cultivation. A lease of fourteen years, with a power of renewal for seven years more, is perhaps the best arrangement. Fruit and nut growing may be advantageously combined. In good soil forty standard trees of apples, pears or plums and damsons may be grown on an acre on which 320 nut trees may be growing at the same time; while during the earlier years, ere the filberts have reached their marketable size, gooseberries, currants, or potatoes may be profitably grown between the rows. But when the filberts have reached their proper size, the crop alone from it will yield a reliable return, keeping a steadier average than that yielded by any fruit crop. In 1882, the value of the nuts exported, nearly half of which went to America, amounted to £59,428, a sum nearly one-third more than that realized from the nuts exported in 1880.

Water-cresses, if grown along with osiers, may yield an additional profit of from £10 to £12 per acre. In Jersey, Mr. Dunster knew the tenant and proprietor of a small garden obtain 8s. to 10s. weekly by sending her water-cresses twice a week to market. They grew in a shallow stream of water about 4 feet wide, running past the end of the garden farm. In low-lying osier grounds, water-cresses will always grow in the wettest places; and on sites supplied by springs from the uplands, let three or four drains, 2 feet deep by 3 feet wide, be dug, and they may be filled with water-cresses, which under the shelter of the osiers will yield a large crop. It may be necessary to plant a few bricks or large stones to intercept the too rapid flow of the water after sudden storms, which deteriorates the growth of the young plants. Water-cresses are either raised from seed or cuttings;—the latter being lengths of 4 or 5 inches with several fine rootlets taken from the roots of old plants.

In 1882, the Custom Returns gave 180,849 tons of esparto grass valued at £1,281,105, or somewhat more than £7 per ton, as imported into Great Britain for the purposes of the papermaker. The discovery of this fibre about a quarter of a century ago, as is well known, saved from ruin a trade whose boundaries have extended co-equally with the course of the years. Already grave doubts are entertained as to the permanence of the supply. Now it is doubtless the part of this journal to say, "Nothing like wood." But practical men know the lack of a more elastic fibre for the perfection of even our cheapest paper, consequently they must welcome the return of the original flax into the manufacture at a price comparable to that of esparto. Mr. Dunster quotes the details of practical flax-growing for the papermaker given in the *Journal of the Royal Agricultural Society of England* (vol. xviii. second series), which go to prove that the crop is as easily managed by the farmer as one of barley or other grain, who needs have no anxiety about weather in harvest time. The stalks are sold just as they come from the thrashing machine. In two instances poor land in Monmouthshire and on the Cotswolds gave £16 and £14, 10s. per acre. The fibre was sold at £4, 10s. per ton, whilst the seed yielded 8s. per bushel. The cost of working and winning the crop might be about £1, 5s. per acre. Altogether, though the profits were far below this which would have accrued had the needed preparation into flax fibre for the linen manufacturer been made, the crop paid better than the ordinary farm crops; indeed, it yielded as much as an acre of wheat and barley put together.

THE SCOTTISH ARBORICULTURAL SOCIETY.

Transactions of the Scottish Arboricultural Society, Vol. XI. Part I. Secretary and Treasurer, John M'Laren, jun. Edinburgh, 1885.

THIS is pre-eminently a Forestry Exhibition number of these *Transactions.* The president's address, which was delivered just after the opening of the late Murrayfield Exposition, brims over with the subject; there is the very full description of the varied exhibits by Messrs. Dunn and M'Laren, deserving the full meed of praise recently given it by Dr. Cleghorn; and a special description of the timber trees of New Brunswick by Professor Bailey and Mr. Jack. Five pictorical illustrations of the building give plan, perspective, and three views of the Society's courts, in one of which is shown not only blocks of timber and the like, but physiognomic delineations of three leading promoters both of the Society and the Exhibition. Altogether this is the best literary memorial of the International Forestry Exhibition published.

Amongst the general articles is a beautifully illustrated monograph of "The New and Rare Coniferæ at Penrhyn Castle," by A. D. Webster; an essay on "Pruning: its Ornament and Utility," by Alexander T. Gillanders of Skibo Castle, which may afford scope for critics on this topic, who, as our readers know, are plentiful. Mr. Barclay describes at length the plantations of Sorn in Ayrshire, really begun by a Countess of Loudon, who, hearing of Dr. Johnson's remarks on the treeless state of the Hebrides, which indeed were extended to Scotland generally, exclaimed, "Deil tak' the man! whar was his een when he didna see my elms?" The arboricultural work begun by the Countess was continued on a more extensive scale by the late Miss Agnes Somervell, who increased the area of plantations, as they are at present, to 600 acres, acting on the old adage that "for agriculture to succeed, arboriculture must proceed." The soil, for the most part, is peaty, in some places pure peat, resting on a clayey sub-soil, and Scots and spruce fir are principally grown. The crop finds ready sale in the neighbouring coal-fields of upper Ayrshire, the extensive Airds Moss collieries being within a few miles of the estate. Formerly the wood was cut by the forester's staff, from 10 to 20 acres being cleared each year; but it is now sold standing to the wood merchant, who employs men to cut it at 3d. per tree, and ½d. per tree to burn the brushwood. It is valued as propwood "from 6 inches at the thick end to 3 inches at the small end, which obtains a price of 5s. 3d. per 100 feet lineal; 6-inch cuts measuring not less than 6 inches in diameter, yielding 7s. 3d. by the same measure; and 7-inch cuts not less than 7 inches, and so for 10s. same standard is given." For the larger Scots and spruce fir, 3d. per cubic foot is obtained. The trees now being cut will measure on an average 30 cubic feet. Mr. John M'Lean writes on "Natural Reproduction of Forests." Hardwoods may be thus reproduced by sowing the seed artificially. Considering the seeds of hardwoods under three divisions, he classes in the first alder, birch, and elm, and like woods, which may be sown immediately after they are ripe; in the second, the seeds of the ash, cherry, hornbeam, and service, which must be gathered and pitted for some time; and in the third, the heavy seeds of such trees as oak, beech, chestnuts, hazel, and maple, which cannot be far dispersed by the wind, and which germinate the spring after they ripen. Such heavy seeds, when gathered ripe, may be planted in vacant spaces of the woods by dibbling them into the soil to the depth of two inches, though the seeds of maples require only an inch in depth. A few women and boys might be employed during autumn to gather such seeds under the supervision of a skilled man, who might previously number the most healthy seed-bearing trees in summer, and see to the proper planting of the crop so won in the vacant woodland spaces. Proper fencing is indispensable; otherwise, ravages by rabbits and the like will exterminate the seedlings. Rocky ledges, on whose almost inaccessible summits there is no soil for the roots of even a young tree to grasp, might be advantageously planted with such seeds. But hardwoods should not be planted in places only fit for pines. The first can only be grown to advantage in moderately low, sheltered situations, not upon exposed sites at high altitudes, which are, however, admirably adapted for conifers.

This fasciculus of a new volume of *Transactions* is a decided advance on previous issues.

THE ENGLISH ARBORICULTURAL SOCIETY.

Transactions of the English Arboricultural Society. Vol. I. Part I. JOHN DAVIDSON, Secretary and Treasurer, Haydon-Bridge-on-Tyne. Newcastle: Sold by F. & W. Dodsworth. 1885.

THE moving spirits of this Society are principally estate agents or wood wardens in the North of England; hence the place of publication of this modest octavo of 45 pages, whilst the meetings whose proceedings it records were in Carlisle, Hexham, and Newcastle. But this young association, as yet but in its fourth year, trusts soon to embrace all England in its scope, and the report of the lecture given by Dr. Lyons, M.P. for Dublin, at Carlisle last winter, under its auspices, shows it already possesses relations with the sister island. Indeed, the opening remarks of Mr. Watt of Carlisle, chairman of its third annual meeting, ably pass under review the most prominent questions in general forestry. These north-countrymen have an indefinite amount of undeveloped energy, capable of uniting all merry foresters even in Robin Hood's country, and farther south, into an harmonious battalion; only let landed proprietors and wood wards together utilize an organization of whose capacity for spreading forest science this pamphlet is alone sufficient evidence. Why should not England and Wales alike be overtaken by a series of lectures on forestry and sylviculture, radiating from fixed centres, just as detailed in this fasciculus of *Transactions?* Mr. Davidson, we know, replies: "Only let parties intimate their wish for this, then local secretaries will be appointed where they don't presently exist, and the attempt will be made." These pages will also be at the service of such praiseworthy endeavours.

As illustrative of the educational aims of the Society, Mr. Clark, of Clark Brothers & Co., nurserymen, Carlisle, sketches the multifarious duties of the wood forester:—

> "In the first place he must possess a knowledge of the management of forest tree plantations and their proper planting, thinning, etc.; he must know the different kinds of trees to suit different soils; he must be a practical drainer, as the ground must be properly and sufficiently drained; he must be able to keep his various estate books, such as a time and a work book; be able to calculate the price of timber, and he must be able to measure the same correctly; he must be able to prepare estimates of the value of draining, planting, fencing, etc., and submit reports of the same; he

must possess a knowledge of machinery and the care of a saw-mill which in nearly every case is driven by steam power; as a rule, he is expected to cut out timber for fencing; to make, or superintend the making of field-gates, hurdles, etc.; and to sum up the whole, it means wood merchant, engineer, joiner, nurseryman, book-keeper, contractor, and drainer, all combined in one single person; and with all this knowledge he is generally considered to be a very modest individual on an estate."

Mr. Davidson pleads that forestry occupy the first place, and that game be merely a contingent or outcome of it. Often crop after crop of newly-planted trees and shrubs are successively eaten off and destroyed, while in extreme winters old and young trees and plants are peeled and eaten round their stems, so as to destroy their vitality, by rabbits and hares. Deer in parks and mountain districts consume as much bark as some of our English tanneries. Black game destroy firs and pines; whilst the preservation of pheasants, grouse, woodcocks, or snipes, etc., practically keeps the forester out of his woods for nine months in the year. All this, and more, is detailed by Mr. Davidson in such a temperate and practical fashion as to merit the thanks of landed proprietors having at the same time woods and game coverts.

Dwellers in populous city pent will study with interest Mr. John Wardle's paper on "Trees and Shrubs suitable for Towns and Suburbs." Are we right in presuming that the detailed list given, specially refers to northern districts bounded, say, by the Humber? The topographical limits of healthy growth of such trees and shrubs, we know to possess special interest to Yorkshire and Scottish landscape gardeners.

THE FOREST SCHOOL, DEHRA DUN.

Report on the Course of Instruction at the Forest School, Dehra Dún' during 1884. By E. E. FERNANDEZ, Esq., Officiating Director of the Forest School. With a Memorandum thereon by the officiating Inspector-General of Forests, and Remarks by the Government of India. 1885.

THIS forest school was made an imperial institution in 1884, and placed under the Inspector-General of Forests to the Government of India; and the present report is the first submitted under the new arrangement. The main purport of the instruction given is to qualify native forest rangers for the satisfactory discharge of their duties. Theoretical instruction is given from the 1st July to the 31st October in vegetable physiology (including the structure of wood), elements of physics and chemistry, mathematics, surveying, road-making, and building. This is followed up by a two months' practical course in surveying, which is found sufficient to pass the students for the lower standard. From January to June the students now under the charge of a special instructor, are taught sylviculture in all its branches, in theory and practice. In all a staff of nine teachers are employed, consisting of conservators and assistant conservators, with two native assistants; of these only Mr. Fernandez gives his whole time to scholastic duties. During the past year, three gazetted officers attended the theoretical part of the course; nineteen students enrolled in the second year's class; a similar number in the first year's rangers' class; and the foresters' class was attended by five students. Conservators report better practical work by their subordinates after passing through this school. But official complaint is made that local governments do not send sufficient pupils. The expenses of the school amounted during the year to nearly £2000. Thoroughly good work has been done by this infant institution; but how it can be made to compass the wants of Britain in the way of forestal education, as gravely proposed by certain venerable M.P.'s, surpasses our comprehension.

Familiar Trees. By G. S. Boulger, F.L.S., F.G.S. With Coloured Plates. By W. H. J. Boot. London: Cassell & Company Limited.

HERE is the first number of a new serial admirably promising to supply a void in the library of the young forester, as well as in that of him bound to the grooves of commerce and trade, but who loves to think of scenes of leafy woods and stately tree avenues. In his first chapter, which is devoted to the oak, our old contributor, Professor Boulger, has a topic well fitted to display the graces of his pen, and combines archæology, botany, and practical forestry in due proportions, whilst the grandeur and glory of the monarch of English forests is worthily depicted in the two coloured plates by Mr. Boot. We cordially commend this new literary venture to public support.

We have to acknowledge receipt, amongst other exchanges, of our Spanish contemporary, *Revista de Montes*, up till 1st August last. We shall afterwards probably present some of its contents to our readers, as well as of the *Scottish Geographial Magazine*.

LEGAL.

THE CROWN AND FORESHORES.

THE ATTORNEY-GENERAL ON BEHALF OF HER MAJESTY *v.* REEVE.

LORD COLERIDGE delivered a written judgment on August 10th in this case, in the Queen's Bench Division, sitting in Banco, Mr. Baron Pollock being likewise on the Bench. The case was reported in our last issue (page 268), and, as our readers will remember, it is a claim by the Crown against the Lord of the Manor of Lowestoft, Suffolk, to establish title to a tract of land, about 1200 feet in width, which it is desired now to utilize for a new dock, and which has been formed by accretions from the sea, principally during the last forty years. Lord Coleridge cited many authorities, including Lord Hale, to show that the rule of the law governing such a case had long been established without any material variation. Thus, Lord Hale, who holds that "the King has a title to *maritima incrementa*, or increase of land by the sea; and this is of three kinds, viz.:—1. The increase *per alluvionem* is when the sea, by casting up sand and earth, doth by degrees increase the land, and shut itself out farther than the ancient bounds went; and this is usual. The reason why this belongs to the Crown is because in truth the soil, where there is now dry land, was formerly part of the very *fundus maris*, and consequently belonged to the King. And indeed, if such alluvion be so insensible that it cannot be by any means found that the sea was there, the land thus increased belongs as a perquisite to the owner of the land adjacent. 2. The increase *per relictionem*, or recess of the sea. This doth *de jure communi* belong to the King, for as the sea is parcel of the wast or demesne, so of necessity the land that lies under it, and therefore it belongs to the King when left by the sea; and so also it regularly holds in lands deserted by a river, that is an arm of the sea or a creek of the sea *prima facie*, especially if the creek or river be part of a fort." 3. Again, in Part i. ch. vii.: "For the *jus alluvionis*, which is an increase of land by the projection of the sea, casting and adding sand and slubb to the adjoining land, whereby it is increased, and for the most part by insensible degrees." "This *jus alluvionis* is by the law of England, the King's—viz., if by any marks or measures it can be known what is so gained; for if the gain be so insensible and indiscernible by any limits or marks that it cannot be known, as well in maritime increases as in the increases by inland rivers." In The King *v.* Lord Yarborough, 3 B. and C. 91, in which the same question as is raised in the present case had been determined by the verdict of a jury, Lord Hale's rule was cited and approved, but no material assistance is gained from this case, for the only question before the Court was whether the accretions in question might properly upon evidence be considered by the jury as "imperceptible;" but when dealing with this, Lord Tenterden, in delivering the considered judgment of the Court, said that the word "imperceptible" must be understood as meaning "imperceptible in its progress, not imperceptible after a long lapse of time." In the case of the Hull and Selby Railway, Baron Alderson, in speaking of the rule in question, gives the same explanation as is given by Lord Hale, saying, "That which cannot be perceived in its progress is taken to be as if it never had existed at all;" and in the Attorney-General *v.* Rees, 4 De Gex and Jones 55, Lord Chelmsford approves Baron Alderson's language. Neither the language of the Digest nor Bracton could be applied to this case, or that, according to Lord Hale, it was "so insensible that it cannot be by any means found that the sea was there;" or, to use his other expression, "that the gain is so insensible and indiscernible by any marks that it cannot be known." On the contrary, the witnesses, who had the best means of observing, are able by marks and measures to indicate what was gained. This is clear from the evidence given by John Henderson, late chief officer of the coastguard at Lowestoft, and James Swan, who has lived there all his life, and has for the last fifty-three years been a harbour and gat pilot there. Henderson said that, shortly before the construction of the north pier had been commenced, the beach above ordinary high-water mark immediately to the north of the pier began to advance, and the line of ordinary high-water mark to recede, and that this advance of the beach and receding of the line of ordinary high-water mark could be plainly perceived from time to time as it went on; that when the wind was blowing strongly from north-west to north, with a high wind, it was often visible from day to day; and that he had often noticed during the prevalence of such winds that the ordinary line of high-water mark receded some 10 or 12 feet in a single tide, leaving an accretion of sand and shingle many feet in depth over the high-water mark of the previous tide. This having been proved by the evidence, judgment was accordingly given for the Crown.

The Value of Land in the Itchen Valley. — This case, Hammond and Others *v.* Lord Ashburton, was tried last month at Winchester, before Mr. Justice Field and a special jury, to whom it was sent by the Court of Appeal in Chancery. The action was with reference to a piece of sedge land (four acres) and the water rights attached thereto at Itchen Stoke, dividing the properties of Captain Hewson, of Ovington House, and Lord Ashburton, of the

Grange, Alresford. For the plaintiffs it was contended that Captain Hewson's ancestors derived their title to the land through an award made under a special Act on September 18, 1813. From that time up to the month of June or July 1879, acts of ownership were exercised by the plaintiff's predecessors in title and by Captain Hewson, both upon the water and the land—by shooting, fishing, turning out cattle, etc.—which is an island situated in the centre of the river Itchen. In 1875 alone Lord Ashburton employed men to take gravel out of the river at the point in dispute, which, on remonstrance, was restored. In June 1879, men employed by Lord Ashburton cut sedge on the island. Captain Hewson again called the attention of Lord Ashburton's agent to this interference with his rights, and the result of a perambulation of the property was that they agreed the island belonged to Lord Ashburton. Some five days afterwards, however, the agent (defendant) sent Captain Hewson word that he had made a mistake in the perambulations—that Lord Ashburton's boundary included the whole of the land in dispute. Subsequently, Lord Ashburton caused stakes and piles to be put in the river, and in irregular positions, all over the water he claimed. For the defence it was pleaded that Lord Ashburton had held undisturbed possession for over twenty years. Neither the plaintiffs nor defendant were rated for the land. In the summing up, his Lordship said the land seemed only useful for sport. The weeds on it had been cut by the plaintiffs, and by them only; and if this was done to secure a right of ownership, then it took in the whole of the land in dispute, for the defendant had never exercised the right of weed-cutting. His Lordship's summing up lasted two hours, and at the conclusion the jury at once returned a verdict for the plaintiffs.

LAND ARBITRATION IN YORKSHIRE.—Mr. J. W. Pickering, of Leeds and Ilkley, claimed from the Midland Railway Company the sum of £4837 for land situated in Ilkley and adjoining the Addingham Road, required by the Company for the Skipton and Ilkley Railway. The case came to arbitration proceedings, which lasted two days. The claim for the land was £1464, that being the result of a calculation at a price of 10s. per yard, with 10 per cent. for compulsory sale, and £3373 was claimed on account of severance injury to the other land and to the building now known as St. Margaret's Parish Room. Mr. T. Fenwick, of Leeds, gave a valuation on behalf of the Company, resulting in a total of £2197, 10s. The umpire, Sir Henry Hunt, C.B., has awarded the claimants £2947. The Company will pay all taxed costs of the proceedings.

FOREST WORK FOR THE MONTH.

ENGLAND.

THE pleasant month of August having passed with its high summer temperature and fleeting thunderstorms, we now enter upon the alpha of the autumn quarter, which is generally the most healthy month in the year; and although the temperature recedes very much, it occasionally proves the hottest month in the year. The summer months this year have been hot and dry; therefore we may expect the heat imbibed and stored up in the earth during the summer, will shed its influence upon September, and induce a temperature little short of average summer heat.

The rainfall is variable during this month in the different sections of the country. Last September the amounts registered at the under-mentioned places were as follows:—

At Greenwich,	rain fell upon	12	days, to a depth of	2·09	inches.
„ Bristol,	„	19	„	1·99	„
„ Edinburgh,	„	18	„	2·36	„
„ Glasgow,	„	21	„	3·51	„

The record of Greenwich was slightly below the average of the ten years 1871 to 1880.

Plantations. — Continue preparations for early planting, as previously recommended, and look through last season's plantings, and see that the plants are not choked by rank vegetation. Evergreens may now be transplanted successfully, if the operation is carefully performed, and the plants shifted with good and compact balls. Should the weather be very dry, copious waterings may be necessary. Endeavour to have the temperature of the water you use for this the same—or warmer—than that of the soil to which it is to be applied. Pruning should be continued in plantations as previously directed. Where some necessity demands that large branches should be amputated from the bole of the tree, this is a favourable time for performing the operation, as the wounds will readily begin the process of healing before the activity of the trees decline into the stupor of winter.

Fences.—Clean young hedges, and continue switching where a neat appearance has to be maintained. Those trimmed towards the end of the month seldom require further cutting during the season.

Paint and tar all fences requiring this treatment during this month and the next; seeing that new woodwork is thoroughly dry before the paints are applied.

WOODS.—Mow and trim the rides and shooting paths, and prune park and hedgerow trees, removing all drooping and irregular branches, that distort their balance and symmetry. Select and mark timber for autumn and winter felling. Scour out ditches, and clean out wood drains during this month and the next.

NURSERY.—Use the digging-fork and rake energetically, and about the end of the month insert cuttings of laurel, privet, yew, etc., and other evergreens propagated in this manner; also propagate by layering such shrubs as are stooled out, and continue budding ornamental trees. A. PATERSON.

PAULTONS, ROMSEY, HANTS.

SCOTLAND.

THE annual growth of forest trees, with the exception of the larch, oak, and Spanish chestnut, may be considered as over for the season; and it is no unimportant work to ascertain what the extent and value of the year's growth is, whether in individual trees, in single plantations, or on the whole estate. In young plantations the growth is usually ascertained by finding the average length of the top shoots, and multiplying it by the number of trees upon the acre. Often this should, in the case of pine and fir plantations, be about 800 trees to the acre. The annual growth of timber-size trees is found by first ascertaining the thickness of the annual layer or zone, and reducing it to cubic measure.

All trees to be cut in winter in the policies, ornamental trees generally, should now be marked with the rase knife, which only makes a scratch in the bark without producing much appearance, and should be done on that side least observable from the drives or walks.

Any recently planted trees not already so treated, should be cleared of long grass and rank herbage, otherwise they will be soft, tender, and feeble, incapable of withstanding the winter's frost. Through such inattention thousands of young trees perish, and thereby blanks are made in the richest and best tree-growing spots in the plantation.

If the weather continues dry, all recently transplanted trees of large growth should be well watered. Trees over a year planted may also require an occasional copious watering.

All charcoal not yet made should be coaled at once, before the nights become long and dark, and therefore unpleasant for night work.

When rabbits are numerous, exposed trees should be carefully looked to, for as soon as the herbage becomes bare, they bark the trees readily, doing great injury often before such a thing is suspected.

Thinning and pruning may now be conducted with general freedom. Now is the time for cutting and cleaning vines, pruning off spray and lateral branches from the stems and trunks of attractive as well as interesting trees, so as to show them to full advantage, removing from them all broken and withered branches that appear from the drives, roads, and walks.

Hollies, whether as shrubs, hedges, or trees, should now be removed. This is decidedly the best month in the year for transplanting holly, and probably also all evergreens. They seldom die if carefully planted now; whereas if planted at other seasons, they almost as rarely live, or at least grow well.

Nursery work, which consists principally in cleaning, should still be carried on. Cuttings of bay laurel should now be planted, and in doing so, they should be made of the strongest of the young shoots, cut so that a small portion of last year's wood is attached. None of the leaves should be pruned off. This is no less a common than bad practice. The cuttings about 9 inches long should be inserted about two-thirds their length into the ground, and the earth, which should be a sandy loam, tramped firmly to them with the foot.

Squirrels, which in many districts of Scotland are the foresters' greatest enemy, should be looked after, and shot wherever found.

Fences adjoining pasture fields should now be well looked to, as additional strain will be put upon them as the pastures become bare.

Seeds and fruits of their respective kinds should be gathered as they ripen, which some (though few) do towards the end of the month. C. Y. MICHIE.

CULLEN HOUSE, 17*th August* 1885.

WALES.

CONTINUE the cleaning and switching of hedges, and attend to fencing of all sorts. Where it is intended to plant young hedges, the ground should be thoroughly prepared to receive the young plants, by trenching, levelling, and draining where necessary.

Finish as early as possible the repairing of embankments and other river work during favourable weather.

The present month is a good time for removing and transplanting evergreen trees and shrubs. Plants removed now with care, and the roots well supplied with soil, with proper attention afterwards, are sure to succeed.

Forest trees may now be pruned, which should be done with great caution.

As the harvest gets finished, the preparation of ground for planting may be pushed forward. Where draining is necessary, no time should be lost in having it done, so that the ground may be in good order for planting. LEWIS BAYNE.

KINMEL PARK, 19*th August* 1885.

GRAFTING.

GRAFTING is now used very little, except for apples. Root-grafting is generally done in the winter, while there is more leisure, and can be done cheaper on that account. Generally, first-class apple stocks are used. These are housed in a cellar or other safe place, secure from frost; and after the grafting has been done, the grafts are laid in boxes in layers, with sawdust, sand, or common earth, and thus kept until spring. December grafting is just as good as later, if the grafts are properly cared for. Tongue-splice grafting is generally practised; that is, a long sloping cut is made on both root and scion, with a tongue raised on each, and the tongues and cuts are fitted neatly together. Some use neither wax nor wrapping material, while most nurserymen use one or both. The advantage gained by wrapping or waxing, in strengthening the graft at the splice (thus saving much breaking in planting), well repays all extra cost. The cheapest, handiest, and best material is a hard wax, applied hot, by means of a pan, a small coal oil lamp, and a wooden, spoon-shaped ladle, whereby a small amount of hot wax can be raised from the pan, and, in the crease of the spoon, enough wax will remain so that the graft can be turned deftly therein, and the joint quickly and completely covered and made air-tight with the hot wax, which cools in an instant and becomes hard. The grafts are drawn through sand immediately after waxing, to prevent their adhering to each other. No hurt comes to the graft from the hot wax. Mould in the joint is largely obviated by this plan of waxing. I have used common packing moss pressed dry, to pack grafts in, and with the very best success of all. N. H. ALBUNGH.

CHIPS.

Prunis Simoni. — Professor Budd, who has been trying to introduce this new tree into the western prairies, has reason to believe it should not be planted except in very favourable localities north of the 41st parallel. As with most of the oriental fruits, it reaches its highest perfection in a hot, dry, summer air, and south of the above parallel should flourish in the prairie States even better than in the valley of the Moselle in France, where it is now popular.

In all respects it is a botanical curiosity. In colour of bark, and in all points, except the net-veining and colour of the leaves, it resembles the peach. In fruit it comes nearer to a flattish, smooth brick-red tomato than to any of our stone fruits, yet in smell and flavour it approaches very near the nectarine.

Its history and character are well given by Simon Louis, of Metz, France (now Germany), in his *Guide Pratique*, who says: "It is one of the most interesting, and undeniably one of the most remarkable introductions made for a long time from the Celestial Empire. It is due to Mr. Eugene Simons, who sent it to the Paris Museum of Natural History when he was French Consul at Pekin. It forms a small tree, with quite large, long, oval, elliptic leaves of a dark, shining green. In general appearance it is between our European prunes and the double-flowering prunes of China. Its flowers are small, white, and open in early spring. Its fruits are very pretty, with very short stem, of the size of the Orleans plum with brick-red or dark cinnabar colour. They are much thicker than long, and have a deep cavity at each extremity. The flesh shows a fine apricot yellow, is firm, and has a peculiar aromatic flavour not found in the plums we cultivate. This distinct species adds a new type to our fruit collection—a type without a representative among our fruit trees."

July in February.—In a graphic account of a garden party given on 6th February last at Pasadena, Los Angelos county, California, by a lady who, a few years ago, dwelt in Mount Florida, Glasgow, we find the following :—

"Fruits in February ! Oh, yes. For breakfast that morning we had strawberries, tomatoes, guavas, bananas, oranges, and lemons and Japanese persimmons fresh from the ranch, and water-melons and apples of the growth of 1884, and all of them delicious. Yes, there is fruit to pick ; and we hunt the luscious strawberries on the vines and the lemon-coloured guavas on the bushes, and the ripest oranges on the trees. And there are flowers to pick ! Flowers in February ! Oh, yes indeed. We have the blossoms of the orange and lemon and peach trees, the ground under the latter covered as with a pink snow. We have the blossoms of the lime hedges and the blackberries and strawberries, and as you see the beautiful clusters of white you would think we were preparing for a royal wedding. And as to geraniums !—well, we do not go to the gardens for them, preferring to let their pink and white and flame-hued blossoms add to the glory of the day. And so we run down to the 'gully,' a chasm that is frightful to look at in places, and there we get our geranium blossoms, aprons full of them. All the refuse cuttings, I must explain, are thrown in the 'gully,' and they take root and grow with rich luxuriance, and convert the frightful spot into a wild garden of the most brilliant hues. And these are not single geraniums, but double ones of the rarest kind. An Eastern florist would go mad to see how recklessly we pull off bunch after bunch of blossoms, but we know nothing will kill the plants after they have once taken root there ; that in a week's time the 'gully' will be all aflame again.

"I am curious to see how many flowers I can find in the garden beds at this time, the dullest season in the year for flowers here. So I go out with pencil and paper and count. I find thirty-three different kinds ; and this count gives no idea of the bloom, for of these kinds there were many varieties of different colour. As, of course, geraniums, not less than twelve kinds ; of roses, as many more ; and if I were to have gone to a neighbour's I should have found 240 kinds of roses in bloom ! And many of these I counted were in the wildest profusion, great clumps of heliotrope from which I could gather a peck of clusters and they not be missed ; while petunias and marguerites might have been plucked by the bushel."

FORESTRY

OCTOBER 1885.

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EDITORIAL NOTES.

THE SITE OF THE NATIONAL SCHOOL OF FORESTRY.—We have the best authority for stating that H.M. Commissioners of Woods and Forests have no individual preference for the establishment of the proposed school at Cooper's Hill, as, following the report of a London newspaper of the Parliamentary discussion on the estimates, we represented them to have in our August number. Let the friends of a Scottish School of Forestry, then, buckle to their work with fresh ardour.

EDINBURGH NEWS ITEMS.—Amongst the prominent events of the month have been the successful completion of the guarantee fund of over £28,000 for the International Industrial Exhibition of next year; and the Scottish Horticultural Society's Autumn Show, a prominent exhibit in which was Messrs. Dickson & Co.'s display of apples. In the Botanical Gardens several well-known trees have been removed.

FORESTRY AT THE BRITISH ASSOCIATION.—At the meeting of this body at Aberdeen, the reading of a paper on the late International Forestry Exhibition by Dr. Crombie Brown, called up Dr. Cleghorn and others to urge the Economic Section of the Association to press on Government the establishment of a National School of Forestry. The neglect of arboriculture and sylviculture in our colonies, which so markedly contrasted with the Governmental care of those subjects in France, Prussia, Switzerland, and Russia, was powerfully dwelt on by the lecturer and subsequent speakers. Dr. Oscar Leon, Munich, when describing the College of Forestry in Munich and in a town in the neighbourhood, stated that there they had a garden where trees were planted, and where the study was made of such subjects as acclimatization, the disease of trees, and the growth of foreign trees, such as conifers.

Mr. Courtney Prance, Cheltenham, said the great need of a School of Forestry in England was more particularly brought under his notice four years ago, when on a visit to Germany. There he studied the management of a School of Forestry. In it the pruning of trees, the diseases of trees, the action of weeds and beetles, the introduction of water and fish and squirrels into the woods, and, in fact, everything connected with arboriculture was studied. The subject was of such importance that men of the highest science might be employed in the development of their woods so as to prevent their serious and reckless destruction, and so that by judicious cultivation there might be a systematic production of capital and labour.

Professor Sidgwick was glad to bring before the committee of the section the matter of recommending a National School of Forestry. Such a recommendation was passed at the concluding meeting of the General Committee.

THE GENERAL PRESS ON FORESTRY.—The issue of Sir John Lubbock's Committee's Blue-book towards the close of August has been the occasion of a plentiful crop of " leaders " from the London newspaper press and other organs of public opinion. Landowners, according to the *Times*, " must learn to exclude sheep and deer, at all events, from part of their forests, to thin out judiciously, to remove the maturer trees by successive fellings, and to act upon the maxim that a forest ought to yield a constant and increasing annual income." The New Forest, instead of a model to private owners, is a warning of the effects of ignorance and lack of care. According to the *Standard*, the greatest enemies to the Scottish forests are the sheep, and, to a lesser extent, the larger game. Indiscriminate browsing cuts away the undergrowth on which the wood depends for reproduction ; and when the storms which periodically sweep broad tracks through the Highland forests have spent their force, no germs are left for self-perpetuation. In this way the woodlands have turned into heather, to the total exclusion of any other form of vegetation. So extensively, indeed, have these causes operated in Scotland within the century, that the area under wood has decreased by some two hundred thousand acres, and has mostly been exchanged for unproductive moor which still perplexes the Southerner by the name of " forest." Nevertheless, the *Standard* believes, with Mr. M'Quorquodale, that it is in the Highlands that the main chance for English forestry exists. They consequently offer the best sites for a practical School of Forestry, as the Blair Athole woods alone testify. According to the *Daily Telegraph:* " The remarks of M. Boppe upon Windsor Forest and the New Forest are fuller of interest than an ordinary novel. 'The surveyor of Windsor Forest,' he says, 'is by turns a forest officer, an organizer of shooting parties, a director of royal workshops, and the conservator of a museum of antiquities, and can naturally have little time to devote himself to sylviculture.' The comments of our kindly French critic upon the New Forest are still more discouraging, and we trust they may attract the notice of Sir William Harcourt, in the leisure afforded him by immunity from office, and by the peaceful tranquillity of his sylvan retreat. Therein might, indeed, be a platform 'cry' for aspiring politicians in the demand that the noble forests of the United Kingdom should henceforth be so managed as to yield a large and increasing annual revenue. In short, the 'Report from the Select Committee on Forestry,' like many other documents, goes to prove that no small portion of our existing agricultural depression is due to unpardonable ignorance and carelessness."

The *Revue des Eaux et Forêts* for September has also a long article on British Forestry, translated from the *Saturday Review*. *Chambers's Journal* for the same month has an article, "Are the Canadian Forests being exhausted?" where it is argued that provision must be made by law for the protection of the Canadian forests both against the devastations of fire and the injudicious operations of the woodman.

SMALL FARM AND LABOURERS' LAND COMPANY.—At the first general meeting of this Company, held in London on September 8th, the Chairman (Lord Thurlow) intimated that there were 5652 shares held very largely by working men. They had determined to sell 200 acres of the 400 acres given to the Company by Sir Robert Lindsay (now Lord Wantage), and they had no difficulty in disposing of this in small lots to seven or eight persons, who were to be meanwhile tenants and to pay up the price of their holdings by degrees. They were receiving letters every day from landowners wishing to sell land, and from people desiring to buy. In answer to Mr. Russell, one of the working men from Northamptonshire who had become shareholders in the Company, desiring assistance in taking up some suitable land there belonging to Lord Wantage, the Chairman promised to do what they could to facilitate such a purchase. The idea of the men is that each build a house on an acre of land and pay for it by instalments, as well as renting land in certain portions, some wanting ten or twenty, and some up to fifty or sixty acres. Some of those men were cowkeepers, having several head of stock. They were industrious men, wanting to spend their time in cultivating land. Those who had eight or nine acres would be able to help those who had forty or fifty acres in their surplus time.

AN ISLE OF AXHOLME SMALL CULTIVATOR.—The *Irish Farmers' Gazette*, in discussing the question of small farms in England, cites the following instance:—"In the parish of Sturton, Lincolnshire, the occupiers of one acre and under are mostly labourers employed on farms; but particulars of his holding were given to Mr. Frederick Impey, honorary secretary Allotments and Small Holdings Association, Birmingham, by one whose sole occupation is his farm. Mr. Impey has systematically inspected a large number of these small holdings of various sizes, and states that the following may be taken as a fair sample of the experience of a man who lives on a five-acre farm. Thomas Bush is 65 years old, and 30 years ago there was not enough for men to do, which made him wish for land of his own. His wages were 12s. per week. He was married and had seven children. He was a thrifty man, who, helped by his wife, managed to save about £10 per year, and when it reached £100 of ready money, he bought a property of five acres for £355; he let three acres and worked one and a half acres, and having by this time got work on the railway, where wages were better and savings consequently greater, he was after a while able to take to all the land and build a house for £130. The five acres are worked as three fields, and the sales from it in 1884—a year of prices 20 per cent. under former averages—were 5 qrs. wheat, 7 qrs. barley; pigs made £19, straw over £4, and potatoes £5. The total of sales was £47. For home use was kept pork, wheat, potatoes, and poultry, worth £14 at least. The only outlay for the farm of any account was that for pigs and their food of about £10. T. B. told me, as the best proof of the return from his farm, that he had saved enough by farming to pay off all his mortgage if he had not preferred to buy more land."

THE AMERICAN FORESTRY CONGRESS.—This Congress has issued an address in preparation for the annual meeting at Boston on September 22, 23, and 24, earnestly appealing to all patriotic citizens to arouse public sentiment to the necessity of reform in the utilization of American timber supply, and the treatment of American forest lands. To effect reform in this line of economics the following action is advocated:—1. The thorough enlightenment of the public on forestal reform. 2. To encourage further research and instruction in forestry matters by the establishment of experiment stations, the introduction of lectures or courses on forestry in schools and colleges, the assiduous employment of the press in disseminating correct practical information. 3. To promote and assist the formation of local associations for the purpose of furthering the true interests of forestry in every State, teaching and encouraging a systematic use of her forests, and imbuing her citizens with a recognition of their importance. 4. To urge the Legislature of the different States to enact and enable the enforcement of effective laws for the prevention of fires. 5. To urge the National Government to the establishment of a sound policy as to its own forest lands, treating the 85,000,000 acres of public forest property as a valuable national treasure, instead of allowing its waste by depredators and fires. 6. To harmonize the interests of the lumberman and the forester, and devise for the lumbering interest such protection as is *not given at the cost of the forest.* 7. To create popular sentiment against waste and a love and incentive for arboriculture by the institution of arbor days, by favours to tree planters in the form of premiums, bounties, or exemption from taxes.

Either directly or indirectly the following results are summarized as arising from the previous work of the Congress:—1. Forestry associations have been formed in Minnesota, Ohio, Canada, Manitoba, Colorado, New York; while horticultural and agricultural societies have been led to give a prominent place in their discussion to the subject of forestry. 2. Forestry Commissions or Commissioners, either to inquire into the needs of or to manage the forest domain of their States, have been appointed in Vermont, New Hampshire, New York, Pennsylvania, Ohio, Colorado, California. 3. Arbor days have been instituted in fifteen States of the Union and in the Canadas. Under this incentive in Nebraska, where this observance originated, more than 5,000,000 trees were planted the past year. 4. The effective fire legislation now prevailing in Canada was enacted directly upon the specific recommendations of this Congress. 5. The Congress of the United States, largely through the influence of our efforts, has under serious consideration most important legislation with reference to the forests of our national domain. 6. The Forestry Bureau, as a branch of the Agricultural Department at Washington, has collected valuable material in furtherance of the knowledge of our forest condition, in addition to Prof. C. S. Sargent's invaluable work of the census of 1880. 7. While the publications of a "Journal of Forestry," "Forestry Bulletins," "Forestry Manuals," "Forestry Reports," have tried to furnish the needed special information, the press throughout the country, in all its branches, has done good work in creating a widespread interest and a growing readiness for action. Yet, while the need of a change of policy is admitted, the means of accomplishing that change are still inadequate. Specific aims and methods yet remain undetermined. Here is a great problem of national economy worthy the thought and active aid of the best men of the nation! Here is a duty for every thinking and well-meaning citizen, to help to preserve and hand over to our children, in full productive power, one of our richest natural resources—nay, the most potent factor of national prosperity!

On reading this address, it occurs to ask if our British societies are but half awake to the forestal cause they too have taken in hand to advocate?

Shortage of Canadian Spruce Timber Crop.—According to the *Canadian Gazette* of August 13th, it is confidently asserted that the shortage of the spruce timber crop for this season will be fully 112,000,000 feet, divided as follows:—St. John's River, 30,000,000 feet; St. Croix, 10,000,000 feet; Penobscot, 37,000,000 feet, and Kennebec, 35,000,000 feet. It has already been stated officially that the forests of Prince Edward's Island have disappeared before the axes of settlers and lumbermen. How will the old European countries, now so much dependent on Canadian timber imports, receive this new warning to re-afforest?

Money in Forests.—The Canadian Dominion may also learn as to the profit of forest conservancy from the fact that the minor wood industries of the United States already represent a large annual sum. In 1880 bark used for tanning purposes was consumed to the extent of nearly two millions of tons, and 17½ millions of dollars. The wood used in barrels and casks came to close on 34 millions of dollars; baskets used up two millions worth; and carriage and waggon factories nearly sixty-five millions worth. All this was independent of the claims of domestic and naval architecture.

The Forestal Needs of the United States.—The Mayor of Clifton took occasion, in welcoming the Society of American Florists, which this year held its sessions on August 13th and 14th in the neighbouring city of Cincinnati, to hope that the claims of forestry would thus receive a fresh impetus. The devastations of floods, which often included destruction of the surface with its native flora and indigenous underwood, and the subsequent long summer droughts with their fatal consequences alike to forests, springs, and landscape, imperatively demand a stronger public sentiment on national tree-planting. "It is not enough that we encourage the planting of some thousands of ornamental trees and shrubs for the towns and cities, which is but a trifling matter; it is our solemn duty by every means, and with all the influence that we can exert, to demand that thousands of acres, for a timber supply, shall be planted for the people, and that every man must be up and doing with all his might, if we would prosper, and to see to it that no tree falls to the ground unless the law provides that ten others shall be planted to take its place."

THE AMERICAN FLORISTS.—This meeting, referred to in the preceding paragraph, was a great success; there being four hundred in attendance. According to the President, Mr. John Thorpe, there are 2000 first-class gardeners in the United States, besides thousands of amateurs. Over 24,000,000 cut roses were sold last year, and there might be 125,000,000 carnations; some £40,000 might have been paid the Dutch last year for hyacinths and tulips; 700 people are supposed to be engaged in selling florists' supplies, and there are probably 2000 cut flower sellers. Florists have grown fourfold in ten years. Catalogues have increased fivefold.

THE WORK OF SQUIRRELS.—Mr. Hillenmeyer returns to this question in the September number of the *American Gardener's Monthly*, and questions if these rodents can have denuded Norway spruce twigs found on newly-fallen snow under isolated trees. Neither does this appear to be the work of insects. Observers have here work in the coming winter.

SINGAPORE BOTANIC GARDENS.—Upwards of 70,000 forest tree nursery plants were propagated during the year, and have been mostly sent out to the forests of Singapore, while a minority has been sent to the forests of the neighbouring minor British settlements or sold to the public. The trees sent to the forest consisted of teak, mahogany, serayah, gum copal, merbau, toon, illippi, rain tree, and mixed native trees. Of the plants sold to the public, a large number were *Fourcroya gigantea* or Mauritius hemp; the remainder were principally ornamental trees, shrubs, orchids, etc. "Coca" (*Erythroxylon coca*), whose wonderful properties were described from personal experiment long ago by Sir Robert Christison, and which is now doing so well in Ceylon, promises to be grown in Singapore with profit. During the visit of H.R.H. Prince Oscar of Sweden, he planted, at the request of H.E. the acting Governor, a palm tree (*Caryota urens*) near the position of those planted last year by Princes Edward and George of Wales

A SEPTEMBER RAID IN NORTHUMBERLAND.

ONCE more at Riccarton Junction, in a bright September sunset, and amidst the clear air of the Cheviots, making glad the heart of fugitive from crowded city. We shunt off from the main route to Carlisle by the valley of the Liddle, and pass many miles of treeless, houseless bog-land, ere arriving at the commencement of the northern branch of the tree-like course depicted on the map by the North and South Tyne and their affluents, ere uniting to form one river a few miles above Hexham, whither we too are bound.

The South Tyne has the distinction of passing the highest inhabited house in England, as well as having a fall four times greater than that of the Thames from its source, in a distance four times less in extent. Both Tynes fall in a distance of thirty-four miles or so to their junction. The joining line from Peel to Cross Fells marking their risings, engirdles an area many square miles in extent of land, worth to the farmer in many cases some 2s. 6d. an acre or less, lying mostly on the lower carboniferous and millstone grit formations; and our inquiries are to embrace its worth to the forester. Down the route to Hexham, many remnants of old natural woods adorn the ravines through which ever and anon a rushing burn crosses the railway to join the North Tyne, dividing the attention of the tourist with other relics of Roman invasion, Scotch and English combats, as well as cattle-lifting of more recent times. But we meddle meanwhile with none of these. Around Hexham itself, which, though in a valley, is yet built on a hill, the plough has everywhere conquered the heath. Indeed, the progress of the cereal crops was far before those below Newcastle; whilst the growth of rare shrubs and crowded fruit-trees in the nurseries of Wm. Fell & Co., adjoining the station, may be seen by the traveller on his way to the town. But the abrupt tablelands on either side of the river, with many a characteristic "fell" to break the monotony of those plateaux, the northernmost of which skirts the Northumberland sea-coast, and the other bounds the nearly parallel course of the river Wear, stand out prominently in the landscape. The industrialist may mark, too, how railways skirt the course of the rivers. Ascending some six hundred feet or so above the town to the high nurseries of William Fell & Co., specially devoted to the propagation of conifers and other forest trees, and from which most of the material was supplied, we saw in a radius of six or eight miles sites of recent efforts in reafforesting. On much of the estate of Dilston, known by the agricultural improvements of John Grey, tree-planting has been profitably undertaken. Some fourteen years ago the Duke of Northumberland planted at Dipton Dene and Corbridge Fell close upon a thousand acres, mostly in larch and Scots fir, all of which, according to Mr. Coxon, are doing fairly well. The "holed" trees have done much better than those which were "slit" in. So far back as 1817, the late R. Ormston, Esq., planted on Healey some 640 acres of poor land, useless for the plough, betwixt 500 and 600 feet above the sea-level. The greater part of this was only a poor soil, in some cases of peat-earth alone on the sandstone, but with a porous subsoil, except indeed where the naked rock nearly covered the surface. Whins were hoed out; heather burned off the surface; and damp sites were drained by open ditches from 2 feet to 2½ feet, according to requirement. On dry localities possessing even a semblance of a surface soil, larch was planted. Scotch fir was relegated to sites covered by peat earth or nearly naked rock; spruce fir with a few birch and alder were tried on the bogs, but with poor success, and the birch is now replaced by Scotch fir or spruce. Throughout, two years' seedlings, one or two years transplanted, were employed, mostly slit planted; though in a very tough turf a cross slit, in the fashion of a St. George's cross, was made. This method is preferred by Mr. Jewitt, the present forester on the estate, to whom we are indebted for these details. The ground is thus well broken when the spade is bent backwards and forwards in each slit, and room given for the roots of the tree to spread in all the four directions. The trees were at first planted too closely, about 2700 to the acre being used; distances of from 4½ to 5 feet apart are now found the best to ensure the production of good timber. For two seasons after planting, dead plants were replaced by living ones; during other three years or so the forester carefully removed whins, brackens, or other weeds usurping the ground on which his seedlings had been planted; which were then left to grow for the next ten years; at the close of which a general pruning of dead branches about seven feet high or so was done, a preliminary to the first thinning, when about one-third of the trees were removed. Thinnings were renewed at intervals of three or four years till the final cutting down, which was commenced in 1859, of yet healthy trees, but whose extra timber growth was calculated not to exceed the interest accruing on their then money value. Mr. Jewitt estimates that the money obtained from the periodic thinnings amply repaid all expenses, with compound interest for capital invested in stocking the plantation, rent for land, etc., besides leaving a good margin for profits, whilst at the final fall of the trees a clear balance was left of at least five times the value of the land on which they were planted. Other two plantings have since been effected on Healey estate. In one of 300 acres, done about thirty-seven years ago, with a poor clay subsoil, the larch disease appeared, and the larches which had previously done well were cut down before arriving at the profit-showing stage. In 1852, about 600 acres of very poor moorland, at an altitude of 600 to 700 feet high, were planted on the same lines before the larch disease made its appearance in the district; and they now show some effects of this mysterious complaint, though the larches presented a splendid growth for the first twelve years; what was planted in Scotch fir and spruce promises fairly well. Here there is room for the special labours of the English Arboricultural Society. We may soon expect to hear, through their efforts, more of the local effects of the larch disease. But we desiderate further statistics on the point raised by Mr. Jewitt in the letter before us, that profitable tree-planting depends much on nearness to a market for timber, a railway station or seaport from which it can be sent to market. Thus the value of timber may be double or treble in one part of the country to what it is in another. Such a difference may be very marked even in districts under one hundred miles apart.

The visitor to Hexham, emerging from the railway station, sees the square towers of the old city, forming the farther end of a vista in which, at this season, trees and shrubs of the most variegated colours adorn the sides of a broad walk the ingress to which is freely open. Coming from the north, our visitor will have already had several reminders, by extensive breaks, hot-houses, and other adjuncts of arboricultural practice, that this shady lane is at the extreme end of one section of the Wentworth nurseries. In the autumn time he will be struck by the vigorous growth of choice conifers, such as *Retinospora obtusa gracilis, R. pisifera, R. squarrosa,* which here hold their own with sturdy *Wellingtonia giganteas* or plants of *Biota semperaurescens* and *B. orientalis.* In the collection of Cupressus, the dwarf golden *Cupressus Lawsoniana lutea* as well as the stately *C. erecta viridis* are well represented. *Taxus Washingtonia* may be taken as representing yews of the variegated type, specially of the golden variety; whilst the variegated poplar, *Populus Ontario variegata,* adds a pleasing variety to the autumn foliage of these ornamental trees, concerning which Mr. Brown, the manager, discourses at length farther on in this issue. Roses, which are cultivated this season to the extent of 15,000, add their subsidiary aids to the gorgeous display of foliage from sombre green to bright gold. And extensive plantings of *Mahonia aquifolium* now showing its dark purple fruit, claim for it a place in ornamental grounds as well as game coverts.

The results of two specimens of grafting this summer on laburnum and maple respectively, look at first sight to be of the type of the "Gigantic Gooseberry" paragraph; but we give them as evidenced by personal observation, though the wherefore of the phenomena may not yet have been worked out by the scientist. When the golden variety of the laburnum was budded on the common variety, the bud died; but all the shoots below the bud produced the golden variety. In the same way, we saw plants about five feet high where the sugar maple was grafted on the Norway maple, where the grafts had all died, but the shoots produced underneath the grafts, in many cases four feet down from them, turned out those of the broad-leaved sugar maple. So, in both laburnum and maple, the leaves of the graft replaced those of the original stock.

THE VALUE OF TIMBER AFFECTED BY SITE OF GROWTH.

IN the course of a lecture "On Timbers and their Uses," before the Chamber of Manufactures at Adelaide, South Australia, Mr. Hack gave several telling instances of the importance of the above theme. In that colony it was necessary to consider the effects of the climate upon wood, and it could not be expected that because certain timber stood well in England it would be equally good at the antipodes. Great extremes of heat and cold were very trying to wood, and in a warm climate insects such as white ants or the marine teredo were much more destructive than in places further distant from the tropics. Timbers that would withstand exposure to the weather or the ravages of insects were especially valuable, and of this class red gum and jarrah were the best known and most used for general and outdoor purposes. If the trees and the locality of their growth were properly selected, these timbers were practically imperishable. The red gum from the Mount Lofty ranges was, as a rule, well-grown, straight and close-grained, and of a good colour, though even here there were trees quite unfit for the sawmill. That produced on the Murray Flats was very unreliable, and though the Victorian forests contained large quantities of good timber, so little care had been exercised in the selection of trees that it had been prohibited from use in Government contracts in South Australia. Western Australian jarrah, locally known as Swan River mahogany, which was greatly relied upon in this colony, grew in the south-western districts of Western Australia, the vast granite and ironstone ranges south of Perth being covered with forests of these noble trees, thousands of them with trunks as straight as a mast for

50 or 60 feet and from 10 to 15 feet of girth. Great care, however, was necessary in selecting and cutting the trees, those grown on the slopes of the ironstone ranges being the best. The most reliable timber was not always procured from the largest trees, those of smaller growth giving on an average a turn-out of about 200 cubic feet of clean timber. The reputation of the jarrah was fast spreading, and it had been described by standard writers on the subject as unsurpassed where special tests were necessary. The karri, also from Western Australia, had come into prominence recently, and gave promise of rivalling jarrah in importance. So far it had not been much used in South Australia for general purposes, but the timber inspector to the Admiralty (Mr. Thos. Laslett) gave karri a very high position. The tensile experiments placed it much higher than jarrah. A piece of each wood 2 × 3 × 30 inches showed about the same specific gravity, and while the jarrah broke with a weight of 11,760 lbs. the karri withstood a load of 28,280 lbs. The average crushing weight to one square inch was stated to be—jarrah, 3·198 tons; and karri, 5·140 tons. In a list of timbers suitable for shipbuilding purposes, emanating from Lloyd's, East Indian teak was classed at fourteen years; karri, jarrah, oaks from English, Adriatic, Italian, Spanish, Portuguese, and French forests, together with morung, saul, greenheart, morra, ironbark, Penang cedar, etc., were classed at twelve years; whilst other European oaks, white oak, mahogany, Spanish chestnut, and blue gum, pitch-pine, larch, etc., are allowed nine years. Baltic pines, spruce, and Scotch firs were placed as low as six years. Singapore cedar was another well-known wood that had been extensively used in South Australia, but it had gradually lost its reputation, owing principally to careless selection in the forests. There was no timber that varied so much as this, the red-coloured, close-grained wood being equal to the best jarrah, and much more easily worked, while the light spongy wood was absolutely valueless. The sugar gum from the Wirrabara forests had latterly been brought into use in some of the public works in the colony with fair success, it being a close-grained wood much like the best blue gum, and according to the conservator of forests it had very satisfactorily withstood the attacks of insects. Blue gum was very much akin to the sugar gum, and that from the Mount Lofty ranges was principally used for "felloes," which, if cut from carefully selected and seasoned timber, were unsurpassed. Much of the so-called blue gum imported was very inferior, and cargoes from Corner Inlet and Tasmania had proved no better than stringy bark. The wood shrank, cracked, and twisted, and had lowered the reputation of blue gum. Ironbark and spotted gum from New South Wales and Queensland were good hard timbers, especially adapted for

girder work, and obtainable in lengths up to 60 feet. They were very durable, and capable of sustaining great weights, but were unreliable when exposed to white ants or marine insects. West Australian tuart was a splendid quality of timber, very heavy and dense in grain. It was unequalled for scantling, and was largely used for the heavy portions of railway trucks, etc. Blackwood was strong and durable, being used for railway trucks and coach-building, especially for wheels in light traps. It bends readily when steamed, and was taking the place of American hickory. Once insects obtained entrance to a building the timber of which was suited to their palates the result was disastrous, and hence arose the necessity of knowing the woods that they were least likely to attack. For this reason he (Mr. Hack) had particularly noticed the red gum, jarrah, karri, and Singapore cedar, the others mentioned not being so proof either against insects or rot.

A TALK ABOUT SOME TREE LEAVES.

No. II.—Plates VI. and VII.

OUR leaf album for this month illustrates how leaves of the same family vary so decidedly as by themselves to afford no clue to the species of a tree. In the seven figures depicted in the two accompanying plates, the majority of the leaves have veins running parallel to each other from a central stem; in three at least the outer boundaries of the leaf are nearly identical, yet these do not characterize different species. A comparison of the plates with those in our last issue shows how different varieties of the same tree assume a leafage which admits of no family likeness. After all, the flowers and fruit are the best characteristics of a tree.

PLATE VI.

Fig. 1 is the leaf of the species of Hawthorn, known as *Cratægus sanguinea.* Like other varieties of the family, it is stalked, narrow at the base. The lobes or segments into which its outside area is more or less divided, as well as the irregular toothed character of its surface, are very distinct.

Fig. 2. The leaf of the common alder, *Alnus glutinosa*, has a circular, "orbicular" shape, triangle-shaped towards the stalk, with a hollow depression on top. The under side of the leaf is hairy, or with a little down in the axil of the leaves.

The finely-toothed leaf of the bird-cherry prunus, *Prunus padus*, is shown in Fig. 3. Atop it is of an ovate lance-shaped form, and slightly heart-shaped at the base.

Fig. 4 is that of the aspen poplar leaf, *Populus tremula.* The teeth along the area of its surface are blunted like flattened cones, and are much fewer than in the contiguous figures. The body of the leaf is of a thinner texture, without any white cotton on it, though sometimes very pale underneath. As stated in our former talk, the leaf stalk is particularly slender, so that the blade trembles with the slightest motion of the air.

PLATE VII.

The leaf of the common maple, *Acer campestre,* Fig. 1, has also a long leaf stalk ; it varies in breadth from one to three inches. The Norman-Gothic architectural resemblance of this leaf, given it by the obtuse lobes, mark out the characteristic difference of the figure. The leaf is smooth on its upper surface, but is often downy on the lower one.

In Fig. 2 will be noted the extra series of teeth peculiar to the leaf of the common hornbeam. There is usually down on the under leaf. The parallel courses of the veins from the central axis is well marked.

Fig. 3 depicts a leaf of *Alnus incana,* a North American species of the alder. Mark the keenly saw-shaped teeth, contrasting them with those of Fig. 2, Plate 6 ; as well as the lance-shaped top of this leaf, in opposition to the bay-like depression at the top of the leaf of the common alder, as depicted in Plate 6.

THE EDINBURGH AUTUMN SHOW.—A correspondent of the *Field* calls special attention to the stand of curious and rare plants sent from the Royal Botanic Garden to the Edinburgh Autumn Show. A new species of groundsel (*Senecio speciosus*) was shown, which is perfectly hardy, and has flowered out of doors from seed sown this spring. The florets are bright, shining mauve, and the dark disk is covered with mealy pollen ; a white woolly thickish stem branches and supports heads of three or four blooms. The leaves, with somewhat of the habit and appearance of *Primula japonica,* are of a clear, bright green, and deeply toothed. The pitchers of the nepenthes were artificially filled with water, a great aid to stove plants in the dry atmosphere of the Vegetable Market. The edges of the stand of Messrs. Dickson & Co. were well set off by edges of white and red Cornish heath tied down to the woodwork.

Fig. 1

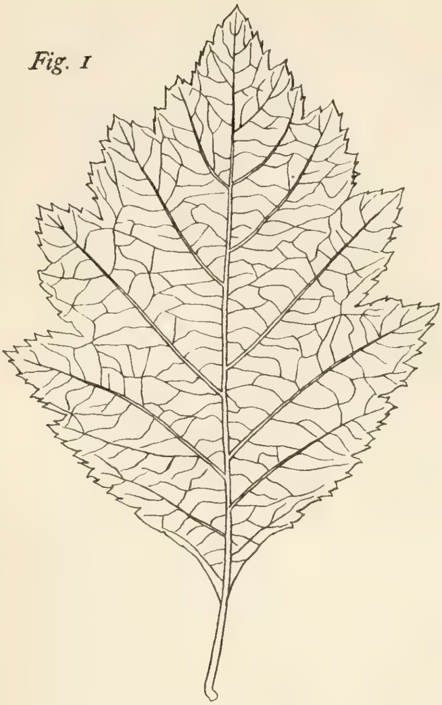


Fig. 2

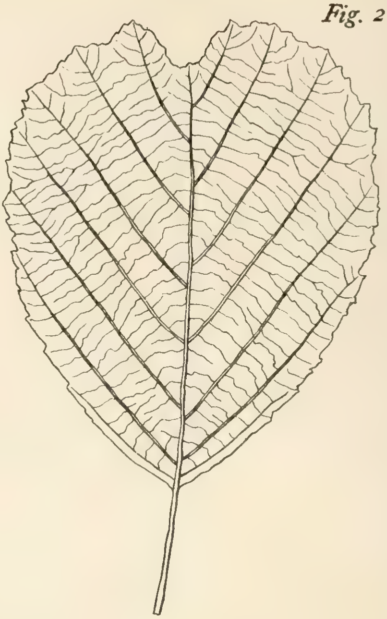


Fig. 3

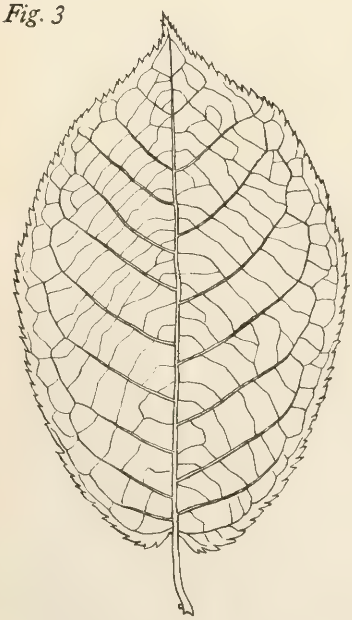
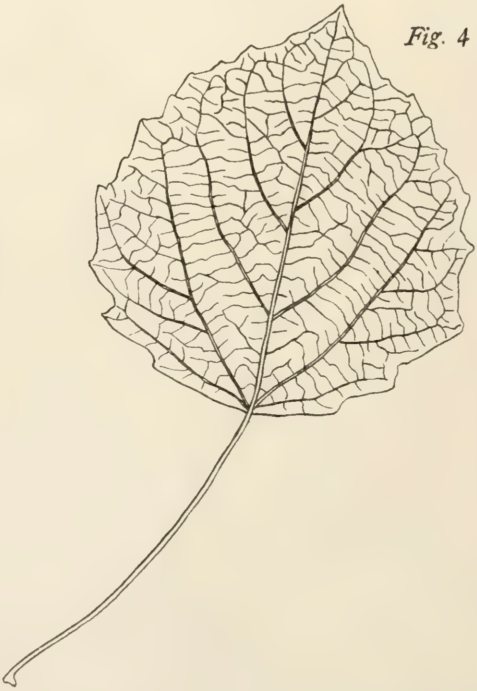


Fig. 4



M^c Lagan & Cumming Lith^{rs}. Edin^r.

Fig. 1

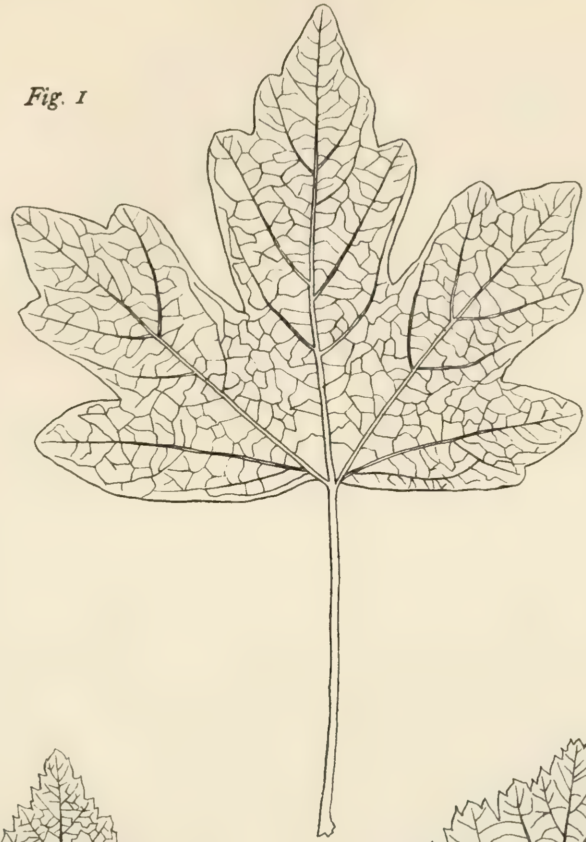


Fig. 2

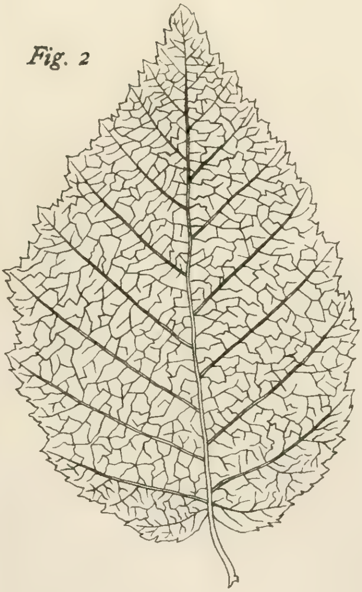
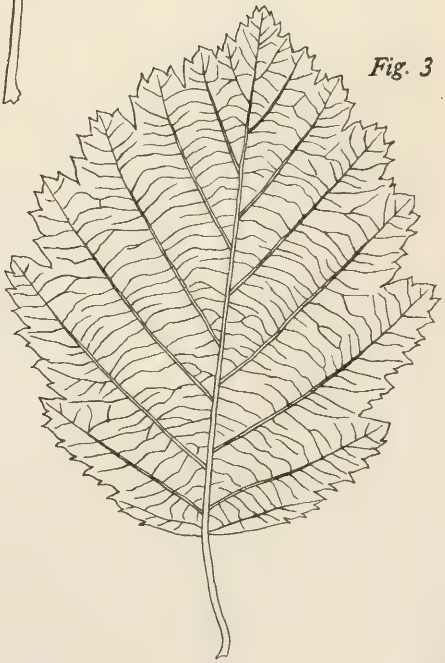


Fig. 3



McLagan & Cumming Lithrs. Edinr.

THE ENGLISH ARBORICULTURAL SOCIETY.

BUSINESS MEETING.

A MEETING of this Society was held on Tuesday, September 8th, in the anteroom of the Town Hall, Hexham. Mr. T. P. Dods occupied the chair, and there was also present:—Mr. J. Davidson, Haydon Bridge; Mr. J. Balden, Dilston; Mr. Taylor, of Edinburgh; Mr. J. W. Robson, Hexham; Mr. Wardle, Newton Hall; Mr. W. Fell; Mr. Milne, Hexham; Mr. Matthew Jewitt; Mr. W. Havelock, Hexham; Mr. Henry Clark; Mr. Matthew Clark; Mr. J. Luke. The following new members were unanimously elected:—J. H. Straker, Esq., Stagshaw House; Mr. Wilson, Leazes Park, Newcastle; Mr. T. Gray, Sheriff of Newcastle; Mr. Malcolm Dunn, Palace Gardens, Dalkeith; Mr. Donald Frazer, Poole South Milford, Yorkshire; Mr. W. Wear, wood merchant, Hexham; Mr. Henry Forster, Bradley Cottage, Durham.—Thanks were voted to Mr. Kay, of Rothesay, forester to the Marquis of Bute, for having presented the Society with a Dendrometer. The time for delivering the essays on the larch disease was fixed for the end of January, and adjudicators for the same were elected. An editing committee was appointed. The secretary intimated that another meeting would shortly be held in this district to discuss other two papers which had been promised, but similar meetings would also be held in the other districts under the local secretaries, when suitable papers were offered. It was agreed to make the annual excursion of the Society to Cragside, Sir William Armstrong's country seat, towards the end of the month.

THE PLANTING OF ORNAMENTAL TREES.

Mr. J. R. Brown, manager at the Wentworth Nurseries, Hexham, then read a paper on the above subject, which he illustrated by specimens of leaves of the different varieties descanted on, thus setting off his words with a new interest.

About the middle of last century, American rhododendrons and kalmias began to be planted in England, and from that period to the present time the taste for, and consequently the importation of ornamental trees, also shrubs from foreign countries, have increased so rapidly, that between 1811 and 1880 above 900 new ornamental trees have been introduced into Great Britain. It is amusing and scarcely creditable to know how very few ornamental trees and shrubs were known to our ancestors. In the days of Queen Anne and of George the First, almost the only ornamental trees and shrubs were the variegated holly and a few of the commoner roses. Whatever our ancestors wanted in the variety, also quality of the trees and shrubs, was however made up in the great quantity of each sort that was planted. High box, yew, or holly hedges, wildernesses of hornbeam, and bowers of roses were the staple ornaments of their pleasure grounds, and a few lilacs and laburnums were introduced by those who wished it to be thought that they possessed a taste for botany.

During the whole reign of Queen Anne, according to Loudon's *Arboretum Britannicum*, not above half a dozen ornamental trees were introduced, and in the reign of George the First not above nine or ten more.

Now that forest trees are being so generally planted, ornamental trees might also be planted alongside of them which would awaken pleasing associations in the mind of every landed proprietor, who is not, like the great lexicographer, predetermined to hate everything vegetable, and who can travel from Land's End to John O'Groat's without seeing beauty in a single tree.

The acacia (*Robina pseudo-acacia*) deserves a place in every shrubbery of extent. Many of the finer varieties are cultivated in the south of England, and attain to stately trees, while some of the commoner varieties are to be found in several of our best planted northern residences; but it must be remembered that they ought to be planted in the most sheltered situations, otherwise they suffer from frosts.

A prejudice appears to exist against the ash, by which it is almost excluded from park scenery, some objecting to it on account of its lateness in coming into leaf in the spring, and others because it sheds foliage soon, while others deny it any elegance of outline, with many more objections to which it appears to be unfortunately liable. The varieties exhibited are increased by grafting on the common ash, and develop rapidly into trees of great magnitude, and ultimately become as timber trees of as great value as the common ash (*Fraxinus excelsior*).

Purple beech (*Fagus purpurea*) is one of the most effective foliage varieties when interspersed among other trees in the park, on the lawn, or in the shrubbery, and is found to prosper in almost all soils. The fern-leaved variety (*Fagus laciniatus*) is often planted with good effect in the outline of ornamental shrubberies, although it seldom attains any great size. Among the first specimens of the purple-leaved variety introduced into this country, one was felled some years ago in Perthshire, of which Mr. Brown had correctly taken measurements after having been felled—height, 60 feet; girth

3 feet from the ground, 14 feet; with a beautiful clear stem of 25 feet, while the branches extended to nearly 50 feet; it was considered the finest specimen in the Northern districts.

The white birch is in abundance in the highlands of Scotland. The variety with drooping-cut leaves (*Betula laciniata pendula*) has long been held in high estimation, and although anxiously propagated in England, is never likely to be so abundant. There are over one dozen varieties of birch in the ornamental varieties, most of which have been imported from North America.

Chestnut (*Æsculus rubicunda*), the scarlet flowering variety, as an ornamental park tree, is surpassed by few trees either in splendour of its bloom or beauty of its foliage, which is seldom, if ever, injured by our most severe frosts. The yellow flowering variety (*Æsculus flava*) also deserves extensive cultivation, and bears good contrast to that of the scarlet flowering variety. The quality of the wood of the horse-chestnut is such as to render it of no value in the eye of the profitable planter.

In reviewing the varieties of the elm, Mr. Brown referred to some fine specimens examined during the recent excursion to Lowther Castle. All the varieties he exhibited succeed best grafted on the Wych or Scotch elm. There are at least twenty-five varieties in cultivation in our northern nurseries.

Paul's double crimson, which is a decidedly distinct variety, bearing clusters of rich double crimson blossoms, which has a pleasing effect to the bright green of its foliage, is perhaps the best of numerous ornamental varieties of the hawthorn. Although it is many years since this variety was introduced by one of our noted south-country nurserymen, there are few specimens of any note to be met with. Mr. Brown saw at the residence of the Right Hon. the Earl of Strathmore, Glamis, Forfarshire, a good many perfect specimens, nearly 30 feet in height, and well balanced. The double pink variety is also very fine in some places in the northern counties. The varieties, which are numerous, are budded on the common hawthorn.

Golden Queen holly is the grandest of all the holly family, and is well named the "queen." The finest specimen Mr. Brown had seen of this variety is growing at Halliburton, Coupar-Angus, being quite 25 feet high, and a perfect pyramid. Silver Queen holly is also noteworthy, having a large margin of pure white round the leaves. Its habit of growing is similar to that of the Golden Queen, and makes a good companion when planted side by side. It may not be out of place to mention a curious physiological circumstance which has often been noticed by botanists in regard to the holly, which is that it is furnished with very prickly leaves near the ground, and almost smooth ones near the top of the tree. The large common hollies in Needwood Forest are said to be of this description. A considerable-sized forest of common hollies used to flourish at Gordon Castle, Banffshire; and there are also many fine clumps to be seen on the banks of the Dee. During the Arctic winter of 1879 hollies suffered considerably, many of them became deciduous, while others, in damp situations, were killed to the ground.

In describing the ornamental varieties of laburnum and maple, Mr. Brown took occasion to revert to the curious phenomena produced on grafting two varieties, on each other, of these trees in Messrs. Fell & Co.'s nurseries; indeed, the paper was in some respects a *vidimus* of ornamental trees there grown, illustrated by fresh leaves. When *Tillia Americana* is grafted on the common lime, the leaves are of enormous size, and the branches slightly drooping, thus deserving a good place in any collection. Amongst oaks, the scarlet variety (*Quercus coccinea*), whose leaves in autumn attain a bright crimson colour similar to that of the Virginia creeper, the variegated variety (*Q. variegata*), and the dark bronze variety (*Q. niger*), as well as the evergreen oak (*Q. sempervirens*), were particularized from among the twenty sorts grown. Attention was drawn to the noble specimens of this tree grown at Lowther and at Beaufort Castles. The golden-leaved Corstorphine plane is recognised by travellers miles distant. The common sycamore is said to have been planted with success near our eastern and western shores. Amongst the leaves of poplars exhibited were those of *Populus bolleana*, which may be classed for its ornamental character with *Populus Canadensis aurea*, the latter variety being an astonishingly quick grower; also of *Populus aurea Van Geerti*, a type of the black Italian poplar; and of *Populus Ontario variegata*, which presents a large gold-coloured foliage. Poplars grow in damp situations by the sides of rivers, lakes, or brooks, where no other tree (the willow and alder excepted) will grow. Mr. Brown reviewed the pines as ornamental plants. A good combination of ornamental deciduous and coniferous trees cannot fail to clothe the landscape with new beauty. Here alone was a source for many new landscape gardening studies by judiciously mixing other trees with such as those enumerated.

In proposing a vote of thanks to the reader, Mr. Davidson said that landowners had been shown how the golden tints of autumn, supposed by old-fashioned people to be due to the progress of the seasons, might by judicious planting be prolonged throughout the course of the year; or at least they might have autumn tints much longer than at present. It was suggested to Mr. Brown to write another paper on the different soils, climates, and localities suitable for the trees he had described.

A QUERY ABOUT SQUIRRELS.

Mr. Fell read a letter from a gentleman whose trees had suffered much from the teeth of those rodents, asking if there were any means by which the trees might be protected without destroying the squirrels. A member present stated that by strewing nuts and other tempting edibles in the eyes of squirrels, on the adjacent ground, he had secured a complete immunity from gnawing for his growing timber.

NOTES ON THE EXCURSION OF THE SCOTTISH ARBORICULTURAL SOCIETY, AUGUST 5th and 6th, 1885.

FOLLOWING up the narrative of this given in last month's journal, it may be interesting to have a little more detailed account of the measurements of the trees than was then given.

At Langholm Lodge, an oak at 5 ft. girthed 11 ft. 8 in., stem 22 ft.; and a lime tree girthed 11 ft. 10 in., stem 45 ft.; the height of this last by the Dendrometer was 90 ft. Of the ornamental trees we noticed some healthy *Abertianas*, the tallest being about 18 ft.

At Netherby we did not find any relics of the ancient forest, "Nichol Forest," which forms part of this estate. This forest was "granted" by James I. to George (Clifford), Earl of Cumberland, and was subsequently bought by Richard Graham in the seventeenth century. In connection with Netherby estate, it may be interesting to quote an author, who thus describes the estate when it came into the possession of Dr. Robert Graham, from whose enterprise in tree-planting Mr. Baty has already told us how great the benefits have been to the property during his term of office. "The lands of Netherby when he (Dr. Graham) became possessed of them were in a state of nature, the people idle and bad,"—this is the country of the "debatable lands," where

. . . . "the good old rule
Sufficeth them, the simple plan,
That they should take who have the power,
And they should keep who can,"—

"and still retaining a smack of the feudal manners, scarce a hedge to be seen, and a total ignorance prevailed of even coal and lime. His improving spirit soon wrought a great change in those parts, his example instilled into the inhabitants an inclination to industry.

They lay in the midst of a rich country, yet starved in it, but in a small space they found that instead of a produce that hardly supported themselves, they were enabled to raise even supplies for their neighbours; that much of the land was so kindly as to bear corn for many years successively without the help of manure, and for the more ungrateful soils, that there were limestones to be had, and coal to burn them. The wild tract soon appeared in the form of verdant meadows and fruitful cornfields. From the first they were soon able to send to distant places cattle and butter; and their arable lands enabled them to maintain a commerce as far as Lancashire in corn. His mode of carrying this out was by erecting hamlets of eight or ten houses, with a number of acres to each, and then permitting his industrious married tenants to live in them rent free, till the produce of the soil would enable them to pay a certain annual stipend, which he increased as the lands were improved, but never so as to become burdensome. He also built schools on different parts of the estate, and in a few years had the satisfaction of seeing upwards of five hundred young persons constantly instructed in them. Thus he increased his rent-roll in more than quadruple proportion." Here then is an exemplary landlord. If such a system of developing agriculture in this country by *peasant tenantry*, such as Dr. Graham adopted, were general on our large estates at the present day, would not our country be prosperous in like manner to the "industrious married tenantry of Netherby"?

The principal trees girted at Netherby were—an

Ash by river Esk	at 5 ft.	gave	10 ft. 2 in.	
A silver fir	,,	,,	12 ft. 2 in.	and 36 ft. high.
A beech	,,	,,	11 ft. 6 in.	
A beech on lawn	,,	,,	12 ft. 4 in.	
,, ,,	,,	,,	12 ft. 10 in.	
,, ,,	,,	,,	12 ft. 0 in.	
A *Wellingtonia*	at 3 ft.	,,	5 ft. 6 in.	and 40 ft. high.
P. Douglasii	,,	,,		40 ft. high.

In the Pinetum (which was once a garden and which is well sheltered) the conifers are very thriving:—

P. lasiocarpa,	25 ft.
P. Douglasii,	40 ft.
P. nobilis,	20 ft.
(This tree is coning heavily, and its glaucus tinge makes it a beautiful object.)	
P. Nordmannia,	20 ft.
P. magnifica,	25 ft.
A *Wellingtonia,*	35 ft.

In connection with the visit to Knowefield Nurseries at Carlisle, we give particulars of a pear tree at Linstock Castle, which was the residence of the Bishops of Carlisle from the foundation of the see in 1133, and continued so for two hundred years, when Rose Castle became their seat. It lies a short distance to the north of the nurseries. It is a remarkable tree. It stands in front of the old tower (now used as a farm-house), a truly venerable patriarch. Doubtless it is a relic of the bishops' orchard, and must therefore be at least 600 years old. The measurements are:—

Trunk 8 ft. high, at 5 ft. girth 13 ft. 5 in.

Dividing into three large limbs, it forms a fine spreading tree 20 yards in diameter. The height is 66 ft. A curious feature of the tree is that one of the limbs, having been broken by a storm a great many years ago, splintered to the ground, and has taken root at 14 ft. from the main trunk, and is now a large tree, and bears fruit freely. The splinter-mark, some 15 in. broad, is completely healed up; no trace of the wound is visible. The tree still yields large quantities of pears. Some idea of its prolific nature may be gathered from the fact that the good lady of the farm-house one season sold as much fruit off it as bought her husband a suit of clothes.

When the excursionists travelled from Carlisle to Penrith, they passed through what was once the royal forest of Inglewood, which extended from Carlisle to Penrith. It so existed up to William III., when it was "granted" to the Portland family, and afterwards became the possession of the Devonshire family. We are told "it was a goodly great forest, full of woods, red deer and fallow, wild swine, and all manner of wild beasts." Now not a tree remains of it. The last tree of Inglewood fell on the 13th June 1823. It stood on Wragmire Moss, and was noticed as a boundary mark for 600 years between the manors of the Duke of Devonshire and the Dean and Chapter of Carlisle.

With Lowther it is different. It stands in the ancient forest of Whinfell.

Wordsworth speaks thus:—

"Lowther! in thy majestic pile are seen
Cathedral pomp and grace, in apt accord,
With the baronial castle's sterner mien;
Union significant of God adored,
And charters won, and guarded with the sword
Of ancient honour."

Lord Macartney, in his description of the Chinese emperor's park at Gehol called "Van-choo-yuen," or the paradise of ten thousand or innumerable trees, says he was never weary of wandering, for so sublime a prospect his eyes never before be held, and concludes, "If any place can in any respect have similar features to the western park, it is at Lowther Park in Westmoreland, which from the extent of prospect, the grand surrounding objects, noble situation, diversity of surface, extensive woods and command of water, might be rendered by a man of sense, spirit, and taste, the finest scene in the British dominions."

A clump of beech by the river-side is a striking example of the necessity of close planting for obtaining the best quality of timber. Many of the trees were considerably over 100 ft. high, one girting 13 ft. at 5 ft.

In Yanwath wood:—

(1) Oak at 3 ft. girted 13 ft. 10 in.
(2) „ „ 5 ft. „ 12 ft. 6 in.
(1) Scots fir „ „ 11 ft. 0 in., with clean stem, 60 ft.
(2) „ „ „ 11 ft. 6 in.

Near the terrace, which is nearly a mile long:—

Sycamore girted 17 ft. 3 in.
(1) Oak at 5 ft. girted 13 ft. 3 in.
(2) „ „ „ „ 16 ft. 0 in., with clean stem 50 ft.
The ash "Eve" at 4 ft. girted 22 ft. 4 in.
P. Douglasii planted fifty years ago,
girted at 5 ft. = 7 ft. 5½ in.
„ „ base, = 9 ft. 6 in.
Height of tree, 90 ft., with spread of branches 65 ft.
P. pinsapo, 25 ft. high.
Hemlock spruce, 25 ft.

At "Jack Croft" an ash gave at 4 ft. = 12 ft. 4 in. and 50 ft. stem.
And a beech „ 10 ft. 8 in.
On the lawn: Spanish chestnut at 5 ft. girted 13 ft. 0 in. and 70 ft. high.
A cedar of Lebanon at 5 ft. gave 5 ft. 6 in. and 40 ft. high.
A yew with clean stem 15 ft. at 5 ft. = 10 ft. 2 in.; and
One „ 6 ft. „ = 10 ft. 2 in.

Some of these old trees doubtless formed part of the Forest of Whinfell, which at the beginning of last century was famous for its prodigious oaks. At Brougham Castle—"The Windsor of the North"—to which part of Whinfell Forest belongs, it is recorded there existed at the beginning of this century a trio named the

"Three Brothers," "the skeleton of one of which yet remaineth about thirteen yards in circumference a considerable way from the root." Firewood seems to have been a useful and highly-prized article in this forest, for "John de Ueteripont gave to the Priory of Wetheral for the health of the soul of himself, and of Sibil his wife, twenty cartloads of firewood yearly out of the forest of Whinfell."

But Whinfell too is now gone—whither? We read: "When the timber began to be cut down, extensive tanneries were established at Temple Sowerby, which were supplied with skins chiefly from Ireland and America." WHITE HEATHER.

NOTES ON BRITISH ORCHIDS.

BY A. D. WEBSTER.

(*Concluded.*)

S. æstivalis (summer *Spiranth*).—A taller species than the last, the rootstock more horizontal, with longer and more cylindrical clustered tubers. Leaves narrow, lanceolate, usually larger than those of *S. autumnalis*, and clasping the flower stem. Stem from 7 to 9 or 12 inches in length, and surmounted with a rather loose spike of numerous small white flowers, individually larger than those of *S. autumnalis.*

This plant, a native of damp, boggy ground, may be readily distinguished from the latter species by the flower stem, which issues from the centre of the leaves, and is usually much taller. The leaves are long, narrow, and pointed; the lower pair short and rather blunt, those farther up much larger and more pointed. From ten to a dozen or more flowers compose the spike, these being large (in comparison with *S. autumnalis*), and loosely, irregularly, and spirally arranged. It is, in Britain, a rare plant, having only been recorded from Hampshire, Worcestershire, and the Channel Islands. On the Continent—especially in France—it is abundant, and is frequently imported in considerable numbers by plant dealers. I have grown and flowered this species fairly successfully from tubers kindly sent by a continental friend. It requires a damp soil, such as a mixture of leaf-mould and peat with a small quantity of sand, and to be planted in a shady situation. Flowering period, from July to August, much depending on the season, as well as altitude at which it is grown.

Genus 13.—*Epipogium.*—A leafless saprophyte like *Corallorhiza*, but distinguished from that genus by the spurred flower. Ovary not twisted.

There is one species *E. Gmelini.*

E. Gmelini or *E. aphyllum* (leafless *Epipogium*).—Rootstock not unlike that of *Corallorhiza*, but usually longer and stouter. Flower-stem 4 to 8 inches in height, jointed near the base, and with three or four rather large pendulous flowers of a pale yellowish hue. Sepals and petals narrow lanceolate, margins involute. Lip heart-shaped, superior, and distinctly marked with small dots on the surface. Spur short, thick, and projecting underneath the lip.

This is one of our rarest native plants, having only been recorded from one station in Herefordshire. On the Continent it is, however, widely distributed but very scarce, usually only a few plants occurring in the same locality. It grows amongst rotten leaves and decayed wood, usually in shady situations amongst trees and in thickets. The peculiar colour of the plant, combined with its small stature and leafless formation, renders it at all times difficult to recognise. It flowers in August.

Genus 14.—*Epipactis.*—Rootstock creeping. Stem leafy with purple, brown, or whitish flowers in a raceme. Sepals and petals spreading, the latter shorter than the sepals, but otherwise similar. Lip contracted in the middle, free from the column, concave at the base, with two basal protuberances. There are two recognised species, *E. latifolia* and *E. palustris.*

E. latifolia (Broad *Epipactis*).—Stem from 1 to 3 feet in height, slightly pubescent above. Leaves large, broadly ovate, ribbed, and clasping the stem. Upper leaves smaller than those lower down and more lanceolate. Flowers varying in colour from dirty white to dark purple, although greenish purple is the ordinary colour, drooping, and usually, though not always, in a one-sided raceme. Flowers varying in colour from dark purple, drooping, and usually, though not always, in a one-sided raceme. Sepals broadly-ovate ; petals ovate-lanceolate. Lip entire, acuminated, and usually shorter than petals.

When well grown, this plant is not exceeded in stature by any other species, specimens from 2 to over 3 feet in height being not uncommon. It is also a strong growing plant, the stem when fully formed and mature being remarkably stiff and erect, with a plentiful supply of leaves broadly ovate at the base but gradually becoming smaller and more lanceolate as they ascend. The flowers, which are pendent and racemed, vary very much in colour, specimens from dirty white to dark purple being in some districts not uncommon,—the extreme form being by some botanists recorded as a distinct species under the name of *E. purpurea,*—but from exceptional opportunities of investigation, I doubt this claim ; slight variations in the breadth of the leaves and form of the terminal lobe of the perianth lip certainly occur in various specimens of *E. latifolia*, but none of these are either sufficiently distinct or constant in character to warrant the plant being accorded specific identity. On finding the white-flowered form several years ago, I own I was somewhat puzzled, although at the time I labelled it *E. latifolia alba ;* but since then I have found it on various occasions, but always in company with the normal form, and after a careful examination of several hundred specimens, and taking into account the variability of colour in the flowers of *E. latifolia*, I cannot think otherwise than that it is but a well-marked form differing only in colour of flowers from the normal species. I could in one wood alone show all gradations of colour, from pure white, through the normal green, to the deep pinky purple of the so-called *E. purpurea*. *E. latifolia* is in this country a frequent occupant of woods and the margins of shady fields, and seems by no means particular as to soil, provided it is not peaty or excessively damp.

I have, however, always noticed its preference for a somewhat stiff, stony soil or even gravel; indeed, about the largest and finest specimens I have found were growing in the latter class in a retentive subsoil.

In some of the woods and pastures of Carnarvonshire this plant is very abundant, but I have never noticed it at a greater elevation than about 200 feet. As a garden plant it is of great interest, but requires careful transplanting so as to preserve the roots intact, neglect of which will soon prove fatal to even the strongest specimen.

I have found in some quantity a white-flowered form of this plant, which is extremely handsome and a valuable addition to our garden plants. The flowers are of a creamy white, but the plant otherwise resembles *E. latifolia* unless in the colour of stem, which is of an ashy yellow. It grows in considerable numbers in one of the woods here, the normal form also occurring frequently in the same place.

E. ovalis.—If not a distinct species, this is certainly a very abnormal and beautiful variety of *E. latifolia.*

Regarding its claims to specific identity, botanists are by no means agreed, some describing it as a form, while others have raised it to a distinct species. It is a rare plant, being only known in a few localities in Britain, and there very sparingly distributed. Years ago it was found in some plenty on particular parts of the Orme's Head, but through the enthusiasm of collectors in that quarter few specimens are now met with. It is an occupant of the most denuded limestone rocks and cliffs, and braves fearlessly the hottest glare of the noonday sun. There, growing only where *Pyrus aria* could find a footing, it seems quite at home, and almost puzzles one to fancy where the nourishment necessary for the bare existence of life can be obtained. The plant seldom exceeds a few inches in height, with ovate leaves, and a beautiful spike, large in proportion to the plant's size, of variously-coloured flowers, resembling in not a small degree those of *E. palustris,* but darker in colour.

Regarding its right to specific distinction, the first and greatest point of difference between these plants is, that the rootstock of *E. ovalis* is shortly creeping, the new buds or eyes being formed one close to the parent stem and the other at a distance of usually 2 inches; whereas in *E. latifolia* the new plant is *always* formed close to the old stem and *never* at the termination of a rootlet. It is also strange that, if the plant is but a form of *E. latifolia*, in the half-a-dozen British stations from which it has been recorded there exists little or no difference either in the stature or general appearance of the plants. Again, when transferred from the bare, parched rocks on which it is always found to the better soil and more sheltered situation of a garden, the habit is not in the least changed nor do any of the characteristics of *E. latifolia* become developed, which one would naturally expect if the plant be but a form of that species that has become altered by a combination of soil and general surroundings. I have grown and flowered the plant for a number of years.

E. palustris (Marsh *Epipactis*).—Rootstock widely creeping. This is a smaller plant than *E. latifolia*, with a more slender, wiry stem, and narrower unplaited leaves, the lowermost only inclining to ovate, and tapering to a point. Flowers slightly drooping, much larger and handsomer than those of *E. latifolia*, and the bracts shorter than flowers. Sepals and petals ovate and pointed internally, dirty white streaked with pink or purple. Lip crenate, obtuse, white, variegated with crimson or pink.

This handsome plant is a native of wet, marshy ground in various parts of Britain, more especially in the vicinity of chalk or limestone, and within the influence of the sea. Although by no means common, yet in particular spots it is very abundant and increases rapidly. The stem is usually about a foot in height, purplish, and with a few ovate-lanceolate leaves, largest at the base and gradually tapering upwards. The root of this plant, although described by all botanists as similar to *E. latifolia*, is widely different from that species, and forms an unerring guide as to the plant's identity. It elongates each season, the thickened fibre forming at its termination an eye or bud.

Strong, healthy specimens will not unfrequently produce two or three young plants during the same season. Under cultivation it is easily managed by planting the root in a wet, boggy part of the garden, and where it will at all times receive an abundant supply of moisture. Once thoroughly established, it soon increases. It flowers in July.

Genus 15.—*Cephalanthera*.—Habit and general appearance of *Epipactis*, but differing in the flowers being erect, sessile, and usually much larger. The lip has no protuberance at the base of the upper portion as in *Epipactis*.

Included in this genera there are three species—*C. pallens*, *C. ensifolia*, and *C. rubra*.

C. pallens (White Helleborine).—An ornamental plant from 12 to 18 inches in height with a fibrous rootstock as in *Epipactis latifolia*. Leaves at the base broadly ovate, the uppermost narrower and gradually diminishing to lanceolate bracteas.

Flowers upright or more correctly sub-erect, large and handsome, of a creamy white colour, and produced in a rather lax raceme. Sepals and petals ovate-oblong. Lip obtuse, shorter than the sepals, and distinctly marked with yellow parallel lines.

A very ornamental and distinct Helleborine that in May and June produces a rather loose spike of erect yellowish white flowers. It is a native of woods and thickets chiefly in chalky districts, and extends throughout England from Cumberland to Somerset and Kent, though always rare. This genus may at once be distinguished from *Epipactis* by the flowers, which are always erect, whereas those of *Epipactis* are pendent. There are also several minute technical differences, especially in the lip and bracts, the latter being always longer than the flowers, this being the reverse in *Epipactis* generally. I have on several occasions found this plant in company with *Epipactis latifolia,* especially when the latter is growing in a free sandy or stony soil on the limestone formation, but never in quantity. Usually it does not attain to the height of that species, although on several occasions I found specimens over two feet in height, but in the same favoured situations many plants of the *Epipactis* had reached a yard in height, thus showing that of the two plants when placed under similar conditions *Cephalanthera* is the lesser.

The rootstock of the present species is invariably embedded at a much greater depth in the soil than that of the *Epipactis.*

C. ensifolia (Narrow *Cephalanthera*).—Stem from 1 to 2 feet in length. Leaves narrow lanceolate, the uppermost tapering to a slender point and resembling those of a reed. Flowers whiter and narrower than those of *C. pallens* and with the sepals more acute. Lip with a distinct yellowish dash on its upper surface and marked with faint white lines.

This may best be described as a very narrow-leaved form of the latter, for in stature and colour of flowers both species are almost identical. There is, however, one permanent distinction — the bracts are always shorter than the flowers, whereas in *C. pallens* they are considerably longer. Like the latter, this is a very ornamental species, but one that is much less seldom seen either in a wild or cultivated state. In a few English and Scotch counties it is frequently met with, extending southwards from Mull and Perth, but it is, like *C. pallens,* local in its distribution and seems to prefer a chalky or limestone district and well wooded locality.

Planted in a fernery and allowed to roam at will, we have found this pretty plant easy of cultivation although somewhat fickle as regards soil and situation. The flowers are produced in May and June.

C. rubra (Red *Cephalanthera*).—Root composed of numerous fleshy, creeping fibres. Stem about a foot in height with a few sheathing scales at the base, and higher up several lanceolate, ribbed leaves. Upper portion of the stem including the ovaries minutely yet distinctly downy or pubescent. Flowers very handsome, erect, sessile, of a uniform rose or pink colour except the lip, which is white edged with red, terminal lobe ovate-lanceolate. Sepals and petals acuminate. Bracts exceeding the ovaries.

This rare plant is, except as regards colour of flowers, almost a counterpart of *C. ensifolia.*

Except in a few stations in Yorkshire, Gloucestershire, and Somerset this plant is rarely seen in Britain. In southern and eastern Europe it is not uncommon, seeming to have a wide geographical range, although never found in quantity. It is a native of mountainous, stony woods and copses, usually on limestone, where amongst detached rock debris, and occasionally with only a scant supply of soil, it seems to imitate in manner of growth its near relative of our denuded limestone rocks—*Epipactis ovalis.*

The flowers, which are produced during June and July, are very ornamental, although usually few in number and loosely placed on the stem.

Genus 16.—*Cypripedium.*—Rootstock fibrous, creeping. Stem leafy. Flowers one or two, with a large inflated lip. Column bearing a dilated, terminal lobe, below which are two short anthers, one on either side. Pollen viscid.

C. Calceolus (Lady's Slipper).—Rootstock fibrous, creeping horizontally. Stem leafy, a foot or more in height, the leaves oblong, acuminate, and ribbed. The flower, for there is rarely two, terminal, large, and conspicuous, having the sepals and petals of a brownish purple, and the lip which is large and inflated of a clear yellow colour or tinged with purplish spots. The upper sepals are broadly lanceolate, ribbed, 1½ inches in length, the two lowermost combined. Petals rather longer and narrower than the sepals, and slightly wavy.

This, the only species of the genus indigenous to Britain, is now becoming very rare, if not indeed quite extinct, in the few Durham and Yorkshire stations from which it has been recorded. On the continent it is, however, widely distributed, and in some places occurs in great abundance; but the hundreds of plants ruthlessly torn up each season and sent into our English markets, must in the long run materially lessen the number even in places where the plant is at present found in almost unlimited quantity. The peculiar structure and elegance of this orchid renders it a very desirable acquisition for the rock garden or flower border.

Nearly 300 years ago (in 1597), this plant was cultivated and figured by Gerard, the illustration being remarkably accurate and minute in detail.

Although by no means readily established, still, with a little perseverance and knowledge of its requirements, success usually crowns the effort. The soil best suited to its growth is a free sandy loam of a calcareous nature, and the position in which it seems most at home a northern or eastern aspect and full protection from the mid-day sun. With a strong well-rooted specimen to start, and by paying attention to the above instructions, this singularly beautiful plant may be readily enough established in any shady garden. Nine out of every ten failures in its cultivation may be attributed to the exposure and rough usage to which the plant is subjected between the time it is lifted on the Continent and planted in our garden.

The flower is produced in May or early June on a stem usually from 9 to 12 inches in length. It is sweetly scented, and during bright, dry weather lasts for a considerable time. The leaves are not unlike those of *Epipactis latifolia*, but of a lighter green, many and distinctly ribbed, hairy or pubescent, alternate, and from 3 to sometimes 6 inches in length. At the base of the stem the leaves are largest and broadest, and gradually decrease in size upwards. A tradition which still obtains credence in the Tyrol is that the old name of this plant, *Calceolus Mariæ*, was bestowed because the plant blossomed under the feet of the Blessed Virgin.

ARBORICULTURE ABOUT STIRLING.

TREES have been intimately associated with the varied fortunes of this ancient burgh ever since the Roman warriors found their triumphant march stopped by the thick fastnesses of the neighbouring Torwood forest. The murder of King James III. was at Sauchie, near St. Ninian's, around which no willows of any kind now grow, although some of the tribe flourish in the valley nearer the river. The Town Council appear determined to make boulevard planting a feature in the town, as the railway traveller passing north is pleasingly reminded. But should he, stirred by the archæological memories of the town, traverse its streets, the graceful rows of stately elms around the King's Park will show him how this is no novelty in the history of the burgh. Old Stirling is preeminently on hills; and the cemetery, now thoroughly modernized, on one of them, should be visited, both for the fine views of the surrounding plains, as well as for the way in which such trees as the laburnum and mountain ash are utilized. The idea of a waste, howling wilderness forcibly brought to the mind by the too prevalent use of conifers in some of the Edinburgh cemeteries, is dispelled; and shrubs recall, so far as floral emblems can, those thoughts of a blessed resurrection which ought to be familiar in a place of Christian sepulture.

Continuing his walk, this time down to the King's Park and along its northern extremity, the visitor will arrive at Coney Park Nurseries, noted in the annals of Scottish arboriculture as being founded by William Drummond & Co. more than a century ago. The present manager, Mr. John Morrison, is indeed a northern veteran, of the section represented by the late Messrs. W. Gorrie, P. Robertson, and others. Of his prize essays we may afterwards have more to say; but his method of treating the breaks of conifers, when planted, with lime and liquid manure, is the marked feature of this nursery of twenty-five acres. So our visitor may traverse many northern or southern nurseries ere he sees breaks of spruce, or Scotch fir, one or two years' transplants, in such magnificent condition. The soil is gravel, which is recognised by agricultural chemists as best fitted to develop the action of such manures on the plant. The locality is well protected. Altogether, there is something in this using of manure in nurseries.

Ceylon.—Mr. J. Alexander, well known to the frequenters of the late International Forestry Exhibition, has been appointed a conservator of Government forests under the new Act just passed by the Legislature of this island.

Cyprus.—The High Commissioner of this island has issued a proclamation calling on the Cypriots to aid the Government in preserving the forests. Trees marked for the purpose by the Forest Department are only hereafter to be cut down. Formerly a tree of enormous size was felled to make a trough, using only a hundredth part of the timber; and perhaps the next day another forest monarch, to make a shovel handle. So for every hundred trees which were standing, seventy-two had been felled, and were left rotting on the ground; while there were only twenty-five seedlings for this number of standing trees. To prevent injury from indiscriminate pasturage by goats, reserves are to be absolutely closed for a certain number of years; and when they are opened, other portions of forest will be closed. Resin, formerly extracted in so barbarous a fashion as to cause the death of the tree in seven or eight years, is not to be gathered till the forests have recovered themselves, after which a proper system of extracting resin may be practised.

HISTORICAL NOTICE OF SOME CELEBRATED TREES.

BY THE LATE PROFESSOR WALKER ARNOTT, LL.D.

PART V.—THE ORANGE, OLIVE, SYCAMORE, MAHOGANY, AND LIME.

THE ORANGE.

THE orange and the citron are known to attain a great age when they are protected from the frost. Tradition asserts (as related by Augustin Gallo in 1559) that the great orange tree of the Convent of St. Sabina at Rome was planted by St. Dominick in the year 1200; and according to Evelyn, that of the Monastery of Fondi, by Thomas Aquinas in 1278. The first of these trees is still, I believe, in existence; but as Gallesio remarks, it was reported by Ferrari in 1560 to be in extreme old age; hence it is probable that the present stock is an offset from the original one, which was perhaps killed by the frost in 1709. The great Versailles orange tree, known by the name of the *Grand Bourbon* or *Francis I.*, was retained by the family, when the effects of the Constable de Bourbon were sold in 1523, because of its great beauty; from which we may conclude that it had attained a great age about three centuries ago. Its traditional age is about 400, and that of St. Dominick about 600 years old.

THE OLIVE.

The wood of the olive (*Olea Europæa*) is beautifully veined, has an agreeable smell, and takes a fine polish; it is also very compact and durable, so that it is not surprising that this tree should furnish instances of extraordinary longevity. Of this classical tree, M. Picconi says that the largest with which he is acquainted grows at Pescio in the State of Genoa; its circumference is 25 feet 3 inches, and diameter 8 feet and 5 lines, or 1157 lines English, that is, about 1050 French lines. Now the average increase of the olive is estimated by Moschettini to be the eighth part of a French inch, or $1\frac{1}{2}$ French lines annually, so that the olive tree of Pescio must be about seven centuries old. But this is probably much below the truth, for Moschettini's estimate of the annual growth was taken entirely from young trees. There is fully a larger tree at Beaulieu, near Nice, which is described by Risso, and recently measured by Berthelot; this is supposed to be more than 1000 years old. Although in 1828 it was in a state of great decrepitude, it bore an abundant crop of fruit. In the citadel of Athens is still preserved an olive tree of which the origin is believed to be coeval with the foundation of the city. The olive trees now growing in the garden of the Mount of Olives, at Jerusalem, are assuredly as old as the time of the Lower Empire, and this is the proof of it:—When the Mussulmen invaded Palestine, every olive tree then found growing paid but one medin or para to the tax-gatherer, and of all those trees planted since the conquest, one-half the fruit belongs to the Grand Signior; and as the 8 olive trees in question pay only the 8 medins, they are therefore estimated at the lowest rate to be 600 years old. Tradition asserts, however, that these same trees were in existence at the time of our Saviour's passion. It is not improbable that many of the existing trunks of olive trees may be new sprouts from the old stock. Thus Chateaubriand says that the olive tree may almost lay claim to immortality, young shoots continually springing from the ancient root-stocks.

THE SYCAMORE.

The sycamore (*Acer pseudo-platanus*) is another of the European trees which appears to reach a considerable age. The most celebrated of this kind known is that which is at the entrance of the village of Trons, in the Grisons, the cradle of liberty among the Rhætian Alps. It appears to be well authenticated that it was under the once wide-spreading branches of this now hollow and cloven trunk that the first confederates met in 1424, and solemnly ratified the league, by which they were to restore liberty to their country. Its trunk 18 inches from the ground is 29 English feet in circumference, or 9 feet 3¼ inches in diameter. If we suppose that it was only a century old, and a younger tree would scarcely have been selected for so solemn a purpose, it has now attained an age of upwards of 500 years. It can scarce be younger; it may be much older than this. In some of the earlier accounts, this tree is said to be a linden. Indeed it is so called in the inscription upon the walls of the adjacent little chapel. They were better patriots than botanists in those days; for the investigations of Colonel Bontemps leave no doubt as to the identity of the tree.

THE MAHOGANY.

The mahogany (*Swicteni mahogani*) is a tree that must be ranked among the most ancient on the face of the globe, when we consider that the hardness and weight of its wood indicate a very slow growth. [Sir W. Hooker mentions that] at Honduras it is not considered to reach maturity till about 200 years old, and that the largest logs exported were 17 feet long, 57 inches in breadth, and 46 in thickness; but these facts are insufficient. Browne, in his history of Jamaica, says that in that country it reaches from 6 to 7 feet in diameter, and if we suppose that it grows as fast as the oak in Europe, or, on an average, 2 lines every year, the age of the largest of these would be 500 years. Lunan says that about the beginning of this century a tree was cut at Elizabeth's in Jamaica, which measured 12 feet in diameter, or 1728 lines; consequently at the rate of 2 lines a year, it must have been upwards of 850 years old; but it is by no means so probable that so compact a wood should grow as fast as this hypothesis requires, so that these presumed ages must be far short of the truth.

THE LIME.

The last exogenous tree I shall notice is the lime or linden tree (*Tilia*), and this is susceptible of attaining a very great diameter, although from the wood not being compact, and the branches spreading much, it is easily destroyed by storms. The largest of which the date is known with precision is that which was planted at Fribourg, in Switzerland, in order to commemorate the bloody battle of Morat in 1476. Though now beginning to decay, it has already proved a more durable memorial than the famous ossuary on the battle-field,—

> "When Burgundy bequeathed his tombless host,
> A bony heap through ages to remain
> Themselves their monument,"—

and may even outlast the obelisk recently erected on its site.

The age of this tree and the girth of its trunk being well known, it has been employed as a standard of comparison in computing the ages of other large trees of the same species. Now in 1831, when this tree was 355 years old, its circumference was 14 ft. 8 in. English, or $55\frac{3}{10}$ in. in diameter. This of course would give a mean annual increase of 1·885 lines, or $1\frac{7}{8}$ lines nearly, English measure, for very old limes, but for younger ones this may be taken at $2\frac{1}{8}$ lines annually. Now there exists not far from Fribourg, but nearer Morat, at the village of Villaro-en-Moing, a still older and larger lime than that of Fribourg, but whose history refers to the same epoch. In 1831 this tree was 74 ft. in height, and 38 ft. 4 in. in circumference at 4 ft. from the ground. According to tradition, it was celebrated for its antiquity and size even in 1476; and the tanners, profiting by the confusion arising from the approaching battle of Morat, mutilated it for the sake of the bark, after which it threw out two immense branches 6 ft. from the root, and which are now sub-divided into five others smaller. If it has grown at the same rate as that of Fribourg, its age will be 1235 years, and it was about 875 years old at the time of the battle of Morat. A third example of lime tree remarkable both for size and its connection with history, is that of Neustadt on the Kocher, in the kingdom of Wurtemberg. According to ancient documents existing in the registers of the town, this tree, which belongs to the large-leaved species (*Tilia macrophylla*), must have attained a great size in 1229, when the old town of Helmbundt having been destroyed by an earthquake, the new one, built along the great road, hard by the lime tree, was called in consequence *Neustadt an der grossen Linden, i.e.* "Neustadt near the great lime tree." An ancient poem, which bears the date of 1408, informs us that "before the gate rises a lime, whose branches are supported by 67 pillars." The number of these columns or pillars of stone, raised to support the heavy and widely spreading branches, which are artificially trained, had increased to 82 in 1664, when the tree was visited by Evelyn, and to 106 when it was examined in 1831 by M. Jules Trembley at the desire of the late Professor De Candolle. To these supports, doubtless, its preservation is chiefly owing, as the tender wood of the lime tree could never support the enormous weight of the limbs, or resist the force of the winds. These pillars are nearly covered with inscriptions, of which the most ancient that was extant in Evelyn's time bore the date of 1551; but the oldest now legible exhibits the armorial bearings of Christopher, Duke of Wurtemberg, with the date of 1558 sculptured on the two front columns. The names of other noblemen who have erected the pillars are severally inscribed on some of them. This tree divides at the top into two enormous branches, one of which is 103 ft. long; the other was broken to only half that length by a gale of wind in 1773. Previously to this accident the tree had begun to show symptoms of decay, partly from injuries not very clearly explained, and partly from the artificial horizontal direction which its larger branches had been trained to assume, but still the stretch of its branches extended to nearly 400 ft. Evelyn, who has given a detailed description of this tree as it appeared in 1664, states that then the trunk was in circumference 37 ft. 3 in. of Wurtemberg measure; and according to Trembley, it was in 1831 still 37 ft. 6¼ in. of the same measure, taken at 5 or 6 feet from the ground, thus proving either that the tree had scarcely increased in diameter during 167 years, or that Evelyn's measurement had been taken nearer the ground, perhaps at the very base where the roots began to diverge. Now, to calculate the age of this tree. We see that the girth at 5 or 6 feet from the ground in 1831 was 37 ft.

$6\frac{1}{4}$ in. of Wurtemberg measure, or 35 ft. 5 in. and 2 lines English, which gives a diameter of 11 ft. 3 in. 8 lines. But it was determined from the tree of Morat, that for an old lime the average annual increase was 1·885 lines, so that the age of this Neustadt tree in 1831 would be 864 years. Now the town of Neustadt was built in 1229, and consequently this tree would have been at that time 262 years old. But if we assume its rate of growth, as in *new* limes, at $2\frac{1}{8}$ lines annually, it would have been only 766 years old, or 164 years old when the town was rebuilt; and this last tallies better with historical documents, from which it appears to be between seven and eight hundred years old. One or two other large lime trees may yet be mentioned. One existed at Depenham in Norfolk in the time of Evelyn, which was characterized in history as the *Tilia Colossœa Depenhamensis.* It was then (*i.e.* 1664) $25\frac{1}{2}$ feet in circumference at the smallest part of the trunk about 6 feet from the ground, and 48 feet at $1\frac{1}{2}$ feet above the surface of the ground; it was 90 feet high. Calculating its age from the rate of growth of $2\frac{1}{8}$ lines in diameter annually, it must have been about 530 years old at that time. There was also a gigantic one at the Chateau de Chaillié, near Melles, in France. In 1804 it measured 15 metres, or 49 ft. $2\frac{1}{2}$ in. English in circumference, or 15 ft. 8 in. in diameter; if this measurement be not taken close to the ground, and if we allow $2\frac{1}{8}$ lines as the annual increase, its age would be about 1063 years. The trunk, divided into six enormous branches, required to be supported.

(*To be continued.*)

THE ENTOMOLOGIST.

JOINT-WORMS DESTROYING WHEAT STALKS.

LAST autumn, American farmers, specially those in the States of Illinois, Michigan, and New York, found much of their wheat straw infested with the larvæ of a four-winged (Hymenopterous) fly, and creased and deformed in the fashion represented in Fig. 1, the black dots on which show places of exit of the flies.

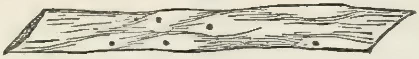


Fig. 1.

This portion of the straw, usually from one to two inches long, though not swollen, was so hard that it could only be cut by a very sharp knife. When this was done, yellow white larvæ were found in cells, about $\frac{1}{16}$ of an inch long, in the solid stem. As the result, the lessened yield of grain has been attributed to the agency of these pests: the eggs of which are white; 75 to 100 in number; 1 mm. long; and each with a pedicel two-and-one-half times as long as the egg; an egg is represented in Fig. 2.

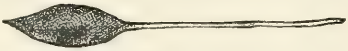


Fig. 2.

Agricultural professors have not failed to turn their entomological pins and microscopes on this wheat pest, as usual with delightfully varying results. Our readers may not object to a pictorial lesson reproduced so far as woodcuts are concerned from the American source, in which Professors A. J. Cook and C. V. Riley interpret each by different figures the insect whose ravages they both deplore. Indeed, Professor Riley also narrates instances of horses sickening and having to be physicked for worms after feeding on straw such as we have above described.

Professor Cook designated the insect as *Isosoma nigrum*, new species, giving at the same time an elaborate scientific description of entomological details, which in the light of what follows need not be reproduced.

Fig. 3 represents a female *Isosoma nigrum* magnified 10 diameters. The length of the body is 4·4 mm.; expanse of wing, 6·5 mm.; greatest width of anterior wing, 1·1 mm.

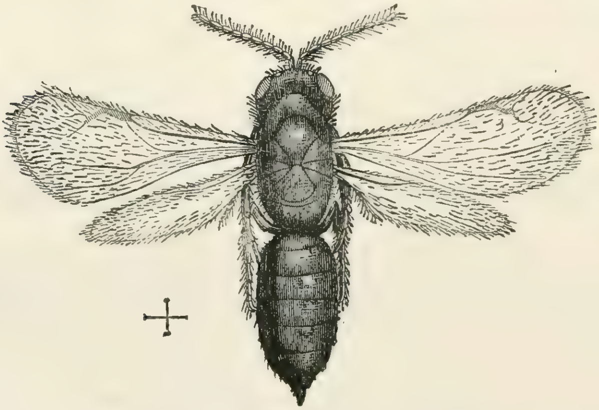


Fig. 3.

On the other hand, Fig. 4 represents a male *Isosoma nigrum* magnified 18 diameters. The length of the body in this case is only 3 mm.; expands 5·8 mm.; greatest width of front wing, 1·3 mm. The males are nearly as numerous as the females, and all have perfect wings.

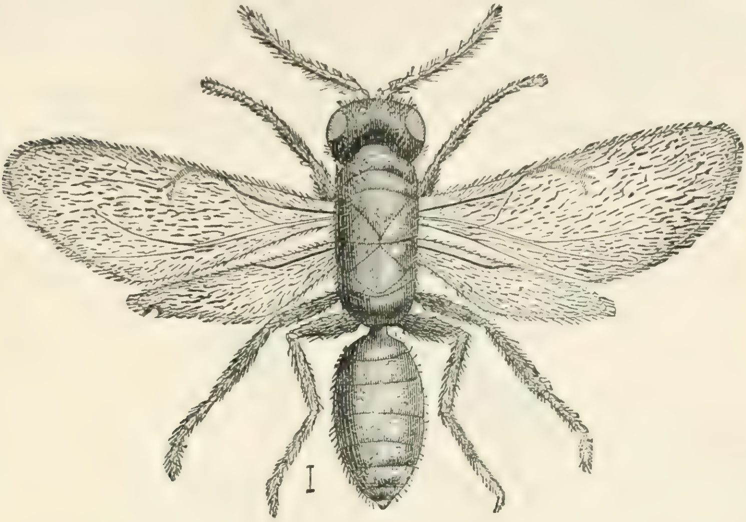


Fig. 4.

The larva (Fig. 5) is yellowish white; length, 4 mm.; jaws dark, without teeth. The antennæ are short, one-jointed, tubercles of the same colour as the body. Very few hairs. Stigmata very obscure.

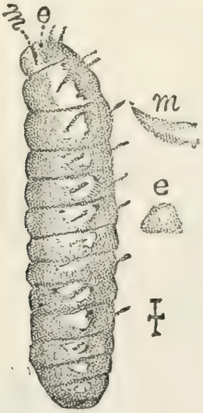


Fig. 5.

m.—Mandible.
e.—Antennæ.

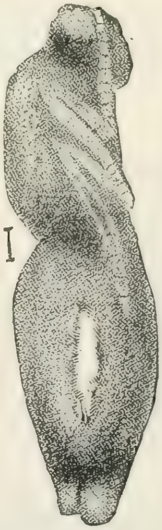


Fig. 6.

The Pupa (Fig. 6) is white in autumn and winter, but black in late spring. Length, 4·1 mm.; male, 3·2 mm. In autumn the wing pads are very indistinct, hardly visible; but in spring they are plainly marked.

Professor Riley on examining specimens, which the above figures are meant to illustrate, and which were sent him by Professor Cook, states that an old well-known pest, *Isosoma hordei* (Harr.), has only been re-described.

Fig. 7 gives representations of *Isosoma hordei*, the true Joint-worm Fly, which was also a great wheat pest thirty years ago. It remains in the straw during autumn and winter; indeed, burning the straw appears to be the most effectual remedy.

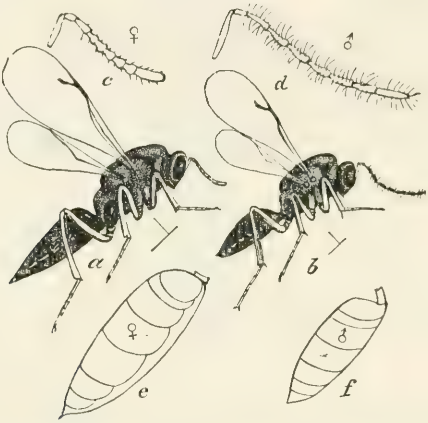


Fig. 7.

a, female, with her antenna and abdomen enlarged (*c*, *e*): *b*, male, with same parts enlarged (*d*, *f*).—After Riley.

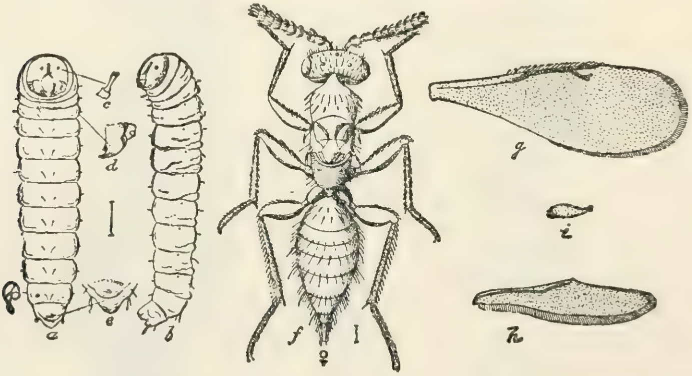


Fig. 8.

Isosoma tritici, the wingless Joint-worm Fly—showing female (*f*); larva (*a*, *b*); and rudimentary wing (*i*); with full developed wings (*g*, *h*) of exceptional individuals.—After Riley.

Dr. Fitch proposed to separate this species into three distinct ones, viz.: *I. tritici*, *secalis*, and *faviceps*. But the researches of Walsh and Riley have relegated these to the rank of mere varieties. According to Riley, Professor Cook's new species agrees with the *tritici* variety (Fig. 8), which, though usually causing the straw to swell, may effect its solidifying and hardening in the way represented in Fig. 1.

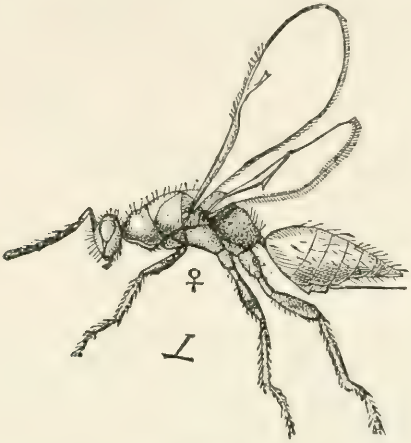


Fig. 9.

Isosoma grande, larger Joint-worm Fly, female.—After Riley.

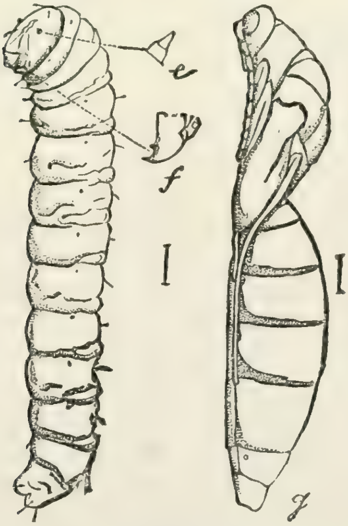


Fig. 10.

Isosoma grande.—*d*, larva; *e*, antenna; *f*, mandible; *g*, pupa.—After Riley.

Insects represented by the last two figures are known only as females, and sum up the three species known to infest wheat. The larva of *Isosoma hordei* abounds usually near the joint, producing veritable galls, the affected stalk solidifying and the external swelling varying in prominence. The other two species, which may prove to be dimorphic forms, live singly in the stalk without causing any hardening or swelling.

So much alike are the larvæ and pupæ of all the three species, that they may baffle the most skilled. Professor Cook's description agrees better with the parasitic *Semiotellus* larva than with that of *Isosoma.*

REVIEWS OF BOOKS.

BRITISH RAINFALL.

Journal of the Scottish Meteorological Society, with Tables for the year 1884, and Coloured Map, showing the Rainfall of the British Isles. Third Series. No. II. Published annually. Edinburgh: W. Blackwood & Sons.

We shall probably return to more than one of the memoirs in this number; meanwhile we direct attention to one of several papers by Mr. Alexander Buchan, the Meteorological Secretary, on "The Rainfall of the British Islands." Foresters as well as farmers may be interested to know the close identity in character of the climate of Skye and that of the southern coasts of the Moray Firth, their mean temperature in no month differing so much as 2°. But the annual rainfall of Skye rises to, and in many places exceeds 100 inches, whereas at Culloden it only amounts to 26·17 inches, and at Burghead to 25·23 inches. So this difference in the rainfall, with the clear skies and strong sunshine which accompany it, renders the south shores of the Moray Firth one of the finest grain-producing districts of Scotland. Skye forms one of four regions in Britain marked off by an average of 80 inches or upwards annually. The others include the greater part of the Lake District, and the more mountainous parts of North and South-Eastern Wales. At Dartmoor the annual average fall is 78·59 inches. And while the rain-gauge at Kylemore, in the west of Galway, gives an average of 89·40 inches, far in excess of all other averages in the west of Ireland, its exceptional character demands further confirmation. At Glencroe farm-house, near Inveraray, in the Western Scottish Highlands, the rain-gauge shows a fall of 128·50. But there is not a single rain-gauge from Luss on Loch Lomond to the Cumberland Lake District showing an annual average of 80 inches. The partial drying of the south-westerly winds in their passage across Ireland, before they reach Southern Scotland, explains this diminished rainfall. Where the south-westerly winds, on the other hand, have a clear passage through St. George's Channel and the Irish Sea till opposed by the high mountain masses of the Lake District and North and South Wales, the rainfall rises in these latter regions above 80 inches. The highest average rainfall in the Lake District is 185·96 inches at The Stye, which, so far as yet observed, is the heaviest rainfall anywhere in the British Islands. The highest in North Wales is 116·90 inches, at Beddgelert; and in South Wales, 96·18 inches at Ty-Draw-Treherbert. All these localities are, like Ben Nevis Observatory, on high peaks above and unprotected by the neighbouring mountain escarpments, and so rain-bringing winds from every direction strike on them. It is probable that future observations at Ben Nevis Observatory will not vary much the present annual rainfall of 146·24 inches, the largest observed in North Britain. The annual rainfall regions of 60 inches or upwards are thin elongated ellipses surrounding most of the mountain masses from Sutherland to South Wales, besides covering similar regions in West Galway and Kerry. Over a fourth part of the surface of England, of about half of Ireland, and rather more than half of Scotland, there is a rainfall of 40 inches annually or upwards. Indeed, this is not reached along the whole east coast of Scotland and some distance inland; while it is exceeded on the east of Ireland, thus showing the influence of the Atlantic and the winds which blow from it on the "Green Isle." The influence of the British mountain chains from Sutherland to the hilly ground of the south-western counties of England on this region of rainfall is well marked on the rain-map, while its extension in comparatively level plains in central Scotland, such as those of Kinross-shire, should prominently affect any scheme of Scottish afforestation. The smallest average annual rainfall, varying from about 22·50 inches to 25·00 inches, extends over the district from the Humber to the estuary of the Thames, exclusive of the higher grounds of Lincoln and Norfolk, where the rainfall exceeds 25 inches. To this is to be added a small patch in the valley of the Thames from Kew to Marlow. In every other part of the British Islands the rainfall rises above 25 inches. The sum of Mr. Buchan's paper is, that the key to the distribution of the rainfall is the direction of the rain-bringing winds in their relation to the physical configuration of the surface. This should consequently dominate any schemes such as that recently proposed by Professor Howitz, for Irish tree-planting by the square mile. In the Green Isle the mountains are not grouped in ranges, but scattered in isolated fashion throughout the country, so the whole of Ireland shows a more uniform rainfall than either England or Scotland. Only in a small district around Dublin is the rainfall below 30 inches,—indeed, it does not go below 29 inches. As regards the rainfall of the 24 years from 1860 to 1883, there was a comparatively large average amount for the second half of the period over nearly the whole of the British Islands. In the more strictly eastern districts, in the means of the 12 years ending 1883, the excess was generally from 5 to 10 per cent. greater than the means for the 24 years.

RAPIDS AND WATERFALLS.

The Scottish Geographical Magazine for September. Edinburgh: Scottish Geographical Society.

Mr. George G. Chisholm discourses at some length in this number on Rapids and Waterfalls. The great river systems of the world are passed under review to show that geological formation and such breaks in the course of rivers have an intimate connection. Thus in South America, granite, mica, slate, and gneiss rocks predominate on the high plateaux which form so great a portion of its surface, so its magnificent streams are useless as waterways for any extensive commerce owing to rapids and waterfalls. An alternation of such rocks as hard limestones with soft shales as at Niagara is a favourable condition for a waterfall. The softer rocks being soon worn away by the abrading power of the water, the harder limestone is undermined, and gives way in time at the joints which intersect its surface. In the falls of St. Anthony on the Mississippi, a sandstone of an extremely crumbling texture underlies a schistose limestone only 15 or 20 feet in thickness, and consequently the recession has been more rapid than at Niagara, indeed more than five times that calculated by Lyell. Instances of the like character, where the mountain limestone has shale below it, may be seen at Ashgill Force on the Ashgill, a tributary of the Tyne; and in the course of the Tees, the Swale, the Yore, and the Wharfe, and many other streams flowing more or less east to west from the backbone of England. In the higher course of the Ericht above Blairgowrie in Perthshire, waterfalls caused by the conglomerate or plum-pudding stone below harder sandstones being most quickly abraded by the current, form a type peculiar to the Old Red Sandstone formation. But other features in the physical formation of a country, such as trap dykes or dislocations, also facilitate the formation of rapids and waterfalls. Given the conjunction of hard with soft rocks, as well as the combination of cracks and crevices into which the current may work its destructive way, and soon these new features in the landscape will appear. Indeed, the rapidity with which a waterfall may be worn back is shown in the case of the lower falls of the Genessee at Portage, New York. Within five years, the period of Mr. Hall's own observation, the depth has increased in some places by 5 or 6 feet, and the southern termination of the channel has extended several rods.

It was proposed to avoid the rapids of the Madeira river in Brazil by constructing a railway 175 miles long. As the project was abandoned, the chief obstacle to extensive commercial relations betwixt Bolivia and Brazil continues. Along the course of the Paraguay, which has no such natural impediments as we are discussing, many villages adorn the banks. The Parana has none above Encarnacion and Candeleria, where waterfalls abound. The Columbia and Fraser rivers in North America have their navigation thus seriously impeded. Steamers are stopped by rapids when only 165 miles from the mouth of the former. A railway, 6 miles in length, surrounds these, and then navigation can be resumed 40 miles farther to the Dalles. Here the river bends to the south in the shape of a horse-shoe, and sweeps with a rapid current through a basaltic trough with vertical walls 200 yards apart. Still higher other falls and rapids occur, with navigable stretches between. The Fraser river is similarly stopped at Yale, 90 miles above its mouth, a considerable stretch of navigable river succeeding this interruption. Mr. Chisholm's paper, which we have only touched, will form an instructive study for winter evenings along with the other contents of the magazine; the map of the Scottish colony on the Shire Highlands should interest that increasing number having correspondents in that part of Eastern Africa.

THE FORESTRY EXHIBITION PRIZE ESSAYS.

Forestry and Forest Products. Prize Essays of the Edinburgh International Forestry Exhibition, 1884. Edited by JOHN RATTRAY, M.A., and HUGH ROBERT MILL, B.SC., etc. Edinburgh: David Douglas.

THIS volume is an example of the merits and evils of the prize essay system. Here are a series of essays, chiefly on side topics, containing much interesting matter, but a part of which might safely have been excised. As a memorial of the late Exhibition, the accompanying plate might have been accommodated to the actual facts of the case. The electric railway did not run right round the building. Of what use, too, are the numerous names of firms on the plan, except to try the eyesight, or as advertisements? The jurors' list is incomplete, and they at length receive—pity! Indeed, the readers of this journal, perusing the Introduction as to the history of the movement, will be struck by the superior character of their own knowledge of the subject. The editors have fallen into the blunder of using *Abies* and *Picea* indiscriminately in naming the same trees. We have said so much in justice to the intelligent reader, who, expecting to find a general vidimus of forestry and its products from the title-page, might be disappointed in discovering that he had purchased a collection of essays of varying size, in many cases on side-paths of the science. Nevertheless, the book contains much valuable matter. Of the twenty-two essays, there are two on the formation and management of plantations in various localities. Others on pine planting, afforesting of waste land, utilization of coppice, and charcoal manufacture, may also interest the British forester. But the essays on teak, wood-pulp manufacture, and the lacquer-tree of Japan, which form the major part of this volume, will alone make it a valuable book of reference. Our contributor, Mr. Cannon, gives his experience on pine planting in France, which might be useful in Ireland. We understand that *Pinus insignis* flourishes in the southern districts of that country; though the spring frosts of England and Scotland may retard its development within their area. Mr. H. Yoshida recommends the introduction of lacquer-trees (*Rhus vernicifera*) into Scotland, the climate and soil being suited for their cultivation. The illustrations include lithographs of this and the teak tree, besides numerous woodcuts.

A. T.

Essay on the Formation and Management of Plantations, in various Sites, Altitudes, and Exposures. By R. Edmond Hodson. Dublin: Hodges, Figgis, & Co.

Mr. Hodson has seen fit to republish from the above volume his prize essay, which, though only receiving a silver medal, as he modestly states in the title-page, the editors appear to value so highly as to place it three stages before that of his competitor Mr. Cannon, to whom the gold medal was awarded.

The problem specially discussed is the planting of an area about one square mile in extent, undulating in its general character, and varying in elevation from 400 ft. to 800 ft. above the level of the sea. The matter is looked at from the side of Irish forestry, and should therefore interest an important section of our readers.

The following summary of the best soil adapted for some of the more common species of hardwood may be taken, as an average sample of the suggestive character of this essay:—

Alder.—A damp, rich soil, in proximity to water if possible.

Ash.—Chalky loam to be preferred, but it will succeed in shallow soils and in exposed positions.

Beech.—A fairly deep, chalky soil.

Birch.—Upland slopes; it will succeed at great elevations.

Chestnut (Sweet).—A deep, sandy loam.

Chestnut (Horse).—A deep, firm loam (timber of little value).

Elm.—A deep, dry loam, in sheltered positions.

Hazel.—Chalky loam; it will grow at considerable elevations.

Hornbeam.—A hard clay soil.

Lime.—A deep, firm loam.

Maple.—A dry, gravelly soil (it is valuable for cabinetmaking).

Mountain Ash.—A gravelly loam.

Oak.—A deep, substantial loam.

Poplar.—A rich, moist soil to be preferred, but it will succeed in most soils.

Sycamore.—A rich, porous loam to be preferred, but it will succeed in most soils.

Walnut.—A rich, well-drained, chalky soil.

Wych Elm.—A good loam.

DR. J. C. BROWN.

Revista de Montes, Ano IX., 1st September, No. 207, Madrid.

THE table of contents of this number contains "El Dr. John C. Brown." On turning to this biographical notice, extending to four pages, of our esteemed contributor, by R. Alvarez Sereix, we were reminded that Dr. Brown had recently left Haddington on a visit to a daughter, who is married to a son of the late Pastor Fliedner of Kaiserworth, and who has for many years acted as a missionary in Spain. If British foresters cannot duly estimate the claims of this prophet of education, let them note how this organ of Spanish governmental forestry significantly concludes an article, in which it traces our hero from his birth at Haddington in 1808 till now, with—"Welcome Dr. Brown." In 1833, Dr. Brown went to St. Petersburg as agent for the Bible Society, and returned to Britain in 1840. He again departed to the Cape of Good Hope as a missionary in 1844. Returning to Scotland, he became for a time Professor of Botany, not in Edinburgh, as his Spanish biographer makes him to have been, but in Old Aberdeen College.

He returned to the Cape of Good Hope to occupy a chair of botany combined with the office of Government Botanist in 1862. The office was suppressed in 1866, a mistake since rectified by the establishment of the Government Forestry Department, and Dr. Brown returned to Europe to continue his mission of propagating forest science by the press, having accumulated an herbarium of 400 species of Cape plants. Any reader of Dr. Brown's twelve treatises on Forestry is aware that the wants of South Africa called them into existence. Dr. Brown's enthusiastic admiration of the work in the Escurial of the Engineers is well known to the readers of his "Forestry" lecture. His exclamation on his recent visit appears to have struck his native auditors, for it is of these constructions that his English words are reproduced amongst a page of foreign type: "*All are Spanish, all are Spanish!*"

ITALIAN FORESTRY.

Nuova Revista Forestale publicata per cura dei Professori dell' Istituto Forestale di Vallombrosa diretta dall' Ingegnere Comm. F. Piccioli, Anno VIII., Dispensa v. con. 17. Tavole Settembre, Ottobre. *Forenze Coi Tipi dell' Arte della Stampa, Via Pandolfini,* 14, *Palazzo,* Aledici, 1885.

THIS Journal of the Forest School of Vallombrosa, near Florence, appears every two months under the editorship of Comm. F. Piccioli. Along with the present number is given an atlas containing seventeen plates in oblong quarto, which must be of peculiar interest to Indian readers, or those requiring to transport timber down precipitous mountain cliffs. A system of haulage ways fixed by iron stanchions to almost perpendicular escarpments is well illustrated; as well as ingenious methods by which the timber loads are temporarily bound together in their transit down from the mountains. At places where this wooden tramway on rollers is intercepted by ravines, the loads are lowered down by capstans into mountain streams, down which they descend for a space, perhaps afterwards to be again transported on a wooden tramway as at their start. Various ingenious mechanical contrivances to facilitate this passage while preventing damage to the cargo are illustrated by working drawings. The greatest novelty in the atlas is perhaps the new method of signalling illustrated. No fewer than thirty-two figures of foresters are given in distinct attitudes; this method is thus proposed to hold communication betwixt men separated by the ravines or high precipices which are amongst the most marked features of the Italian Alps. The system of Brunetta appears to be a double overhead wire tramway, with peculiar appliances for transporting along it by the force of gravity alone tree stumps as they are cut in the forests. In one of the plates such a wire tramway is depicted emerging from a forest, crossing a deep ravine, skirting the base of an irregular hill, and then bringing its burdens directly to the railway loading bank. Another plate solves the problem of placing the load at the terminus of the wire tramway on board a barge. The system might be useful in Britain.

INDIAN FOREST PROGRESS IN THE LAST FIVE YEARS.

Review of Forest Administration in British India for the year 1883-84. By B. RIBBENTROP, Esq., Officiating Inspector-General of Forests to the Government of India. Simla Government Central Branch Press. 1885.

THE Inspector-General of Forests in India at the same time fulfils the functions of Under-Secretary in the Home Department, submitting cases direct to the Secretary. During the last five years the revenue of the Indian Forest Administration has risen from 71 lakhs of rupees to 108 lakhs, chiefly in consequence of the demands on Government forests caused by the destruction of private ones owing to the great increase of railways. Expressed in pounds sterling, the receipts amount roughly to one million pounds, and the net surplus, after meeting cost of establishments, working, protection, and improvement, to four hundred thousand pounds. The total area under the authority of the Department may be put down at 100,000 square miles, representing less than one-half of the minimum forest area which may be said to be necessary for the wellbeing of the country ; but over half of this, the control is of a very limited nature, so that barely 50,000 square miles, or about one-fourth of the required area, can be considered as under real forest conservancy. How this state of matters may be remedied by the extension of his department, Mr. Ribbentrop discusses very ably, though with an amplitude beyond our present limits. We note, however, the enlargement of the Working Plans Branch which has been brought into existence only during the last five years, and which has now a central office under his immediate control. Reserved forests are henceforth to have such working plans dealing, amongst other items, with the calculation of the growing stock, of the annual increase, as well as the quantity of material to be removed, annually or periodically, with due consideration of the production of the forest and of the demand, as well as arrangement for the re-stocking of all cleared areas (natural reproduction, sowing, and planting, protection against fire, grazing, etc.). The enlargement of the domain of the Working Plans Branch includes a record of such documents by local conservators, together with the amount executed in the Inspector-General's Office. It is thereby proposed to afford the Government of India a safeguard as to its valuable forests being managed in the right way, without unduly interfering with the necessary freedom of action of the Local Governments.

SOUTH AFRICAN FORESTRY.

Introduction of Systematic Treatment to the Crown Forests of the Cape Colony. Summary of Rules and Instructions. By LE COMTE DE VASSELOT DE REGNE. Translated by A. W. Heywood, Forest Department. Cape Town: W. A. Richards & Sons, Printers, Castle Street. 1885.

THIS treatise, while designed primarily for officers of the Forest Department of Cape Colony, is worthy of a much wider circulation. Detailed instructions are given as to felling and reproduction, the division of a forest into working blocks, marking trees, as well as the keeping of note-books, observation forms, returns, and inventories of standing forest stock. Were we to quote at all, it would have to be at such length as the other demands on our space do not allow of. Meanwhile we commend the book alike to colonial and home foresters. Two larger treatises are in preparation by the same author, viz. "A Forest Code," and "A Treatise on Forestry, adapted to Colonial circumstances."

ADVANTAGES OF CROWN GRAFTING.—By adopting crown grafting, almost all the advantages of budding upon single stocks are secured, and in this way part of the work can be done in the winter, and not all rushed into the hurry and bustle of summer. In crown grafting it is best to use good, first-class stocks, shortening the tap root a little, leaving 9 to 10 inches of root, and use scions shorter than piece-root grafting, say about 3 inches, and make the splice or union just at the crown or collar of the seedling. Plant the graft about 1 inch below the joint, leaving 2 inches of it above ground. Should any of the scions fail, the seedling will throw up a sucker, which can be budded the same fall, and thus have nearly a perfect stand.—*N. H. Albungh.*

LETTERS TO THE EDITOR.

PEELING OAK STANDING.

SIR,—I offer the following remarks for the benefit of your correspondent who asks some questions on this subject in your September issue, as well as for other of your readers interested in the seasoning of oak timber, for sale or for estate purposes.

Peeling oak standing is not only practicable, but is practised to a considerable extent in Yorkshire, as well as in some neighbouring counties. During summer, passengers by the East Coast route between London and Edinburgh may see the bare stems of oak trees standing at various points between Retford and Berwick.

Not only is the plan adopted by managers of estates for home consumption, but timber merchants who buy large falls of timber standing, treat the oak in this way, finding it beneficial to their trade to do so. I have known purchasers of one or two thousand pounds' worth of oak timber have all trees, above eight or ten feet, peeled standing.

The work is mostly done by piece, and is worth five shillings per ton more than peeling the trees after being felled. The *modus operandi* is for one of the most active of the workmen to climb the tree, armed with a small axe and peeling-iron. He cuts off the branches at a convenient distance from the trunk as he ascends, and if the top runs up very high he also cuts it over where most convenient, and when he has thus cleared the trunk of all branches, he starts at the top, and opens up one side of the bark with his axe, and then applies the peeling-iron in the same manner as if the tree was laid down.

The operator does not trouble to cut the bark into equal lengths, but tears it off in such lengths as he can get, dropping it to the ground as he proceeds. In the meantime others of the squad are dissecting the limbs or branches which were cut off, so that by the time the climber reaches the ground, the party are ready to proceed to another tree. Men used with the work can strip the bark off much quicker than strangers to the operation would think possible.

In the case of tall trees, clear of branches for thirty or forty feet, ladders are used; and above the height reached by these, iron spikes of a peculiar form are driven in at suitable distances for the climber to ascend by. To drive in the spikes he uses his hatchet, which has a head suited for that purpose. As he descends he removes the spikes, which are taken care of for the next tree. The men who climb are usually paid four or five shillings per week over those who work on the ground.

So much for the practicability of the operation. The next point is, How long should the trees stand after being peeled? In the case of timber merchants, this time is limited by the conditions of sale, they having to clear all off the estate within a specified time. If the trees stand one month, they benefit considerably by the operation. If they stand three months, there is much more benefit to the timber,—and from three to six months is as long as I should care for them standing,—but if they stand twelve months they will not be injured. Your correspondent asks, "How long should an oak tree after being peeled stand before being felled as seasoned timber?" That is a question I am not prepared to answer; but if it stood till the outside of the tree began to rot, I should doubt it then being seasoned in the centre.

It is only as a means to an end, I would recommend the peeling of oak before felling it. Every one practically acquainted with felling and peeling oak timber, knows how liable it is to split and open up from exposure to the hot sun. Not only is it liable to split through the centre when sawn off from the root, but along the whole length of the tree we frequently see it split from the outside to the heart. Oak-peeling having to take place when we may expect our hottest weather, it is impossible to prevent this exposure when the operation is performed on a large scale. When oak is peeled standing, all splitting and opening is entirely prevented, and the tree cuts out as sound as possible,—sounder than if it had been felled in the depth of winter. You at the same time clear all cost of labour from the price of the bark, and leave a nice margin for profit. Not only so, but I consider it necessary, when oak timber is felled in winter, for the tree to remain a year before being planked; whereas, if peeled standing and left for three months, the timber is half seasoned, and may be cut into plank immediately. The tree being standing, and exposed to the sun and wind of the summer months, one can imagine it will dry much quicker than if lying on the ground with the bark on.

On estates where timber is felled before being sold, I would say to the managers, If you can get as much for timber peeled after it is felled as you can for timber peeled standing, by all means fell before peeling. If there is no demand to have oak timber which has been peeled standing, it may be worth while to consider whether this is because it has never been offered in that state; and to consider further whether, if offered, it would not bring in a greater price per foot.

Those who require oak timber of large size for estate use, would do well to test this method for themselves, peeling a few trees standing, and a few trees felled. The extra expense is trifling; and if a superior quality of timber is a desideratum, I am certain the result would be most favourable to peeling standing.

In this, as in many other things, the "custom of the country" has an influential bearing, and although in a majority of cases "custom" is right, this seems an operation in which it is safe to make an innovation, and introduce a fresh custom.

Trained as I was in a district where the system is unknown in practice, I was prejudiced against it when first I saw it in operation; but after giving it a fair trial, I found it so beneficial to the timber that for estate purposes I now invariably adopt it.

David Tait.

Owston Park, Doncaster.

ON SEASONING OAK TIMBER.

SIR,—Your correspondent, Mr. Harry Doune, seems to be in want of some information on seasoning oak timber.

Experience of forty years teaches never to strip oak timber, and leave it standing after with a view of seasoning.

My father once had a tree stripped which he left standing, which formed a gummy substance all over its trunk and branches, and in the following spring came out in full leaf again. Our method of seasoning oak, and other kinds of hardwoods, is to have them sawn up into plank, after which we nail a strip of wood on each end to prevent strakes. After you have seen the above done, then place them in the dryer, with a thin strip of wood between each plank so as the draft can pass between each plank. Keep them out of the wind as much as possible, then you will in the course of ten or twelve months have seasoned planks. To get well-seasoned and good dry timber, the longer in plank the better. Of course that will be a question of time.—I am, etc.,

Young Forester.

COUNT A. DE CARS' BOOK—A CRITICISM.

SIR,—This treatise was republished in vol. v. of the *Journal of Forestry*, and as Mr. Sargeant's translation may be adopted as a handbook for forestry students, you may admit the following remarks on it. "Rustic," vol. v. p. 820, pointed out that its advice to nail wood or metal over cavities in growing trees would cause more injury to the saws used in cutting the tree up, than the timber was worth.

At vol. v. p. 402, M. de Cars says: "The secret of obtaining a complete cure in all operations requiring the removal of a branch, either living or dead, consists *in cutting close to and perfectly even with the trunk*. . . . Coal tar as a covering for wounds made in pruning renders the application of this rule in all cases entirely safe."

It is a great fallacy to suppose that the wound, caused by cutting off a branch even with the trunk, is ever healed over. The dead surface is only covered over with living wood.

At p. 405 (*loc. cit.*) he says: "The principle being established that large wounds can be made without injury to the tree, if care be taken in the manner indicated to prevent decay, it is easy to show the advantage of cutting off injured branches of any size." Timber merchants do not think so, and would rather see a decayed stump projecting from the trunk of an oak than a scar, showing that a large wound has been healed over.

The diagram at p. 404 (*loc. cit.*) clearly shows that cutting a branch off in a line with the trunk carries the defect in the timber well into the heart-timber of the tree. However thoroughly the tarred wound is covered over by living wood, the living never joins the dead in the sense that a wound in a man heals. Indeed, destruction to timber must follow an adherence to the theories of this healing.

At p. 549 there is an instance of an oak tree having seven wounds made on its trunk from ten to twenty inches wide. If any two of these, averaging fifteen inches wide, were at right angles to each other, they would spoil every plank in the tree.

On page 576 the author says: "A casual examination will show that between the surface, which has been cut smooth and treated with coal tar, and the new tissues which soon cover it, there is only the thinnest crack or fissure, analogous to the natural cracks or openings which always appear in wood in seasoning, and which, as is well known, do not diminish its strength, elasticity, or value for all industrial purposes."

Those who have worked up timber know very well that the fissures which appear in seasoning oak are not straight, like a wound caused by cutting a branch off, but irregular, and connected by fibres of the timber, so that the severance of the tissues is not so complete as it is between the dead and living surfaces.

If a branch dies through slow decay, the new growth around the dead stump closes in gradually, and carries the defect out into the sap of the timber, where it is much less injurious and smaller in size than it is when the branch is cut off in a line with the trunk.

The advice given on p. 566, etc., is not likely to be followed; first, because of its expense; and second, because few will care to change the natural forms of the pendulous beech, the graceful ash, the sturdy oak, and the massive sycamore, into one uniform shape of a more or less elongated tennis racket.

De Cars' remarks on pruning and training young trees are very good. Large branches of timber trees should never be reduced more than one-third of their length, and should always have their life preserved by being cut outside a promising side branch. His advice as to removal of loose bark may be very useful in a park, but in a wood I should prefer taking down any tree so injured, before decay went further.—Yours faithfully,

HENRY ROGERS, Capt. R.N.

HARTLEY, PLYMOUTH, 15*th Sept.* 1885.

WHY THE TREES IN KENSINGTON GARDENS DIE.

SIR,—When in Kensington Gardens last year, I saw that a great number of large trees had been cut down or rooted; and the observant visitor must have seen how many have died. Dr. Bonavia of Etawel writes the *Gardeners' Chronicle*, showing how care in preventing the removal of the fallen leaves changed a barren soil into a good one:—

"The original soil of this garden was all but barren. By manure and water I got things to grow, and as soon as I had trees and shrubs about the place my constant care was to prevent the fallen leaves from being swept away from under the trees and shrubs.

"I thus allowed their own decayed leaves to become their manure, and whenever I had an opportunity I brought more dried leaves from the outside, and strewed them under the plants. In this way, in the course of some years, a layer of leaf mould covered the soil, which, while it added to the nourishment of the plants, was yearly added to by the fall of the leaves. By the time I left, some persons were accustomed to describe the garden as a 'tangle,' so luxuriantly did things grow."

Is not the removal of all fallen leaves one of the causes of the starvation of the trees in Kensington Gardens? In Kew Gardens also the large trees are suffering from the careful sweeping up of their natural food.

Another cause of the death of trees in Kensington Gardens, is the trees having grown too closely together, without open spaces enough to create a circulation of air.—I am, etc.,

HENRY ROGERS, Capt. R.N.

HARTLEY, PLYMOUTH, 15*th Sept.* 1885.

THE BLADDER-NUT TREE.

SIR,—Many thanks for naming the bladder-nut tree. I have measured it to-day with a rod, and find it exactly 18 feet high, with a spread of branches 13 feet. It is very much injured by a large silver variegated holly standing close to it. I find Babington puts it in the same tribe as the spindle tree, viz. *Celastraceæ.*—Yours, etc. GEO. DODDS.

WYRESIDE COTTAGE, LANCASTER, 18*th Sept.* 1885.

[The spindle tree is of British origin; the bladder-nut is a native of Eastern and Western Europe.—ED.]

ANSWERS TO CORRESPONDENTS.

"YOUNG FORESTER"—TWIGS FROM CURRAGHMORE, IRELAND.—No. 1, *Salisburia adiantifolia*, syn. *Ginko biloba*, maiden-hair tree. A very fine specimen of this singular tree, introduced about a century ago from China and Japan. It is said that only the male plant is in cultivation. No. 2, *Diervilla amabilis*, syn. *Weigela amabilis.* The family are handsome shrubs, natives of Eastern Asia and North America, named after a botanical author. There are many handsome varieties of this and *D. rosea*, some of which are probably hybrids, have white flowers, striped red, purplish red, with many variations of colour. No. 3 is *Pernettya mucronata*, a native of the extreme South of America, the white pendulous flowers of which are distinguished by ten glands alternating with the stamens. No. 4 is *Magnolia tripetala*, syn. *M. umbrella*, the umbrella tree, a native of North America. The usual height of the tree is from 20 to 30 feet high. As you say, yours must be "a beautiful, well-furnished tree" when it is about 30 feet high, and must have been the cause of remark to intelligent observers. Your climate must be excellent which developes such shrubs as this and the maidenhair tree, whose maturity of growth is testified by the leaves sent. The umbrella tree has very large white flowers, slightly scented, appearing in May or June. Has our correspondent observed them?

WILL our correspondents note that "Young Forester" is used twice in this issue, and adopt initials, or some more distinctive mark of their letters?

ARCHIBALD HENDERSON, Tullamore, King's County, Ireland.—The specimen of hazel you send—grown on the property of the Right Hon. Lord Digby—is a new and beautiful variety, which we do not think is at present in cultivation. You appear to be right in naming it *Corylus urticifolia.* But we shall write you shortly on the subject.

ABOUT OURSELVES.—In compliance with the wishes of many of our subscribers, we have reverted to the plan of issuing our volumes annually. The index, title-page, etc., of the present volume will accordingly be presented in their due course.

LEGAL.

DECISIONS BY THE ENGLISH SUPERIOR COURTS CONCERNING LANDED PROPERTIES.

THE *Field* recently summarized the decisions on two cases the particulars of which were recently given to our readers (vol. x. pp. 157 and 317, as well as vol. xi. pp. 268 and 333). The article touches several new points.

Regarding the High Dale Park case, in which the contention was as to whom blown timber belonged, Mr. Justice Pearson maintained that trees blown down, though some of their roots still hold to the soil, and for a season continue to put forth buds in spring, are not attached to the "freehold" of High Dale Park; and were thus the property of the executors under the will of Mr. Ainslie, who enjoyed the liferent of the estate. The new owner, however, appealed against this decision.

The Court of Appeal, composed of the (new) Lord Chancellor, with Lords Justices Cotton and Lindley, reversed this decision. The Lord Chancellor laid down that so long as some "new force" (more than was required to overcome the *vis inertiæ* of timber) was necessary in order to move a fallen tree, the latter should be considered to be still attached to the freehold. If its roots were severed, but had soil sticking to them, it would not be so "attached," and if only minute filaments still held it to the soil, and not substantial roots, it would also be practically severed; but otherwise, if force was required to detach it before removing it, it would be at law still "attached" to the soil. The other Lords Justices concurred. Each judge expressly stated his view that "growth" and "life" in the tree had nothing to do with the question; a tree might have ceased to grow, and yet be attached to the freehold. As Lord Justice Lindley put it, suppose this storm, instead of felling the trees, had blasted them all as they stood. Their life and growth would have then come to an end as fully as if they had been blown down, and yet they would undoubtedly have remained attached to the freehold. This ruling seems sound, and we do not expect to see it disturbed by the House of Lords, even if the case goes up to that tribunal. Had Mr. Ainslie lived he would undoubtedly have benefited by this windfall, for the trees would have been eventually severed and utilized for his benefit. If their remaining roots had even been cut before the breath was out of his body, the fallen timber would have become "personalty" through that process, and as such would have passed under his will. The omission to do this was natural while the owner of the estate was on his deathbed; but it was an unfortunate one for those interested in his personal estate.

In regard to the claim of the Crown to the Norfolk foreshore vacated by the sea as detailed in our last number (p. 333), the main question was one of fact, viz. whether this retrocession of the tidal action had been so gradual as to be imperceptible from year to year, or had been sufficiently defined to be clearly marked from time to time. The Crown claims tidal water and foreshore, not because the tide *does* flow there, but because it *did* flow there at a time when the title of the Crown accrued. If an earthquake were to raise the bottom of the sea high and dry adjoining the estate of a subject whose boundary was "high-water mark," the subject would have no claim to the elevated soil. If, on the other hand, the sea broke in and flooded a subject's lands, the Crown would not thereby become the owner of the submerged soil. This was shown in the case of Mayor of Carlisle *v.* Graham. The river Eden changed its course, and invaded Mr. Graham's soil in a new channel. The public set up a right of public fishing in the new channel, because there had been such a right in the old one; Mr. Graham successfully resisted the claim. Where a margin of water is a landmark, or where an imaginary line between two margins, *i.e.* a mid-channel line, is the boundary, the position of the water *primâ facie* suggests the site of the boundary, but that is all. Where water imperceptibly changes the position of its margin, the landmark suggested by the water also shifts imperceptibly; but if the water from some sudden agency perceptibly alters its situation, then the boundary remains where it can still be identified, even though that land which was dry may have become inundated, and *vice versâ*. Theoretically, at the time when the Goodwin estates were, as history tells us, invaded by the sea, and were transmogrified into what are now the Goodwin Sands, Earl Godwin might have successfully maintained his right to the flooded soil to such extent as he could prove his original boundaries. In the Norfolk case, it was clearly shown that the action of the sea, sometimes in a single flood tide, piled up the shingle to such an extent as to raise the foreshore—which at the tide before had been flooded—once and for all above the level of high water, and for several feet. There was not an imperceptible accretion of foreshore, but the old landmark was violently moved from day to day by the forces of nature. Judgment was accordingly given for the Crown. In this case the Crown looked after its own interests, and successfully; but a converse case might well occur elsewhere, as in the Eden episode.

CAN A PROPRIETOR WORK MINERALS BELOW A PUBLIC RAILWAY?

CHANCERY DIVISION.—*Before* MR. JUSTICE PEARSON.

THE MIDLAND RAILWAY COMPANY *v.* MILES.

THIS was a motion on the part of the Midland Railway Company to restrain the defendant from crossing their line with horses and carts, for the purpose of working certain minerals (namely, clay and gypsum) from the surface of a triangular piece of land of about seven acres enclosed between the plaintiffs' main line and its two connections with a branch. The defendant had been the owner of the minerals under the plaintiffs' line. He gave notice of his intention to work them. The Company gave counter-notice to purchase the minerals within 40 yards of their line, and the defendant now alleged that he was cut off by the act of the Company from all access to his minerals except over their line.

Mr. Cozens Hardy, Q.C., and Mr. Phipson Beale appeared for the plaintiff Company.

Mr. Everitt, Q.C., and Mr. Chadwyck Healey, for the defendant, argued that power given to the owners of several mines by section 80 of the Railways Clauses Consolidation Act did not extend to cases where the Company had purchased not only the minerals under the railway itself, but the minerals for 40 yards on each side, and that therefore he was entitled to a way of necessity over the line.

Mr. Justice Pearson considered that the defendant had the power under section 80 to work under the plaintiffs' line, and by the subsequent section was entitled to compensation for any extra expense in working occasioned by his tunnelling. He said the defendant would not be allowed to do that which would be putting an end to the plaintiff Company by stopping their traffic, and granted an injunction.

FOREST WORK FOR THE MONTH.

ENGLAND.

AFTER an excessively dry summer, abundant rains have fallen during September, and the reviving of scorched nature has been almost magical; whilst weathered pastures show the pleasing change from brown to the luxuriant green they now present, thereby stimulating the drooping spirits of agriculturists.

Occasional violent storms may disturb the equanimity of the weather, and play much mischief amongst our trees and buildings. Towards the end of last October a storm of the first magnitude passed over Glasgow, the maximum force of which indicated a pressure of 25 lbs. on the square foot.

Fogs are generally prevalent at this time, and everything under their influence becomes covered with beads of moisture, which have a pleasing effect when glistening under the rays of the morning sun.

The mean average rainfall is about 2 or 2½ inches, and the evaporation about 1½ inches.

In October last year, the rainfall recorded at the following places was as under:—

At Greenwich,	rain fell on	12 days,	to a depth of	1·04 inch.
„ Bristol,	„	7 „	„	1·167 „
„ Edinburgh,	„	15 „	„	1·50 „
„ Glasgow,	„	16 „	„	3·60 „

The record of Greenwich shows nearly 2 inches below the average of the ten years 1871 to 1880; and that of the other places is also under their averages.

The Orchard.—Gather fruit as it ripens. Transplanting may be done as soon as the trees shed their foliage; and cuttings of gooseberries and currants may be taken off and planted.

FENCES.—Finish switching and trimming hedges. Trench and prepare ground for fresh planting, that it may be subjected to the action of the atmosphere for some time before planting is begun.

Scour out ditches during the month, and convey the cleanings to the compost heap. Examine the outlets from field drains, and give perfect freedom to the discharge of their waters. Look over drained lands, and open up wherever any signs of the inefficiency of the drains is indicated on the surface; remove the obstruction, and carefully relay the pipes to maintain the effective action of the drains.

WOODS AND PLANTATIONS.—Carry on preparations for planting; working up the bare and exposed portions of the ground first, and leaving those parts covered with rough herbage to be worked up last, as they may be done in frosty weather, when the bare parts could neither be so efficiently nor economically worked. Heavy soils should be pitted early, to admit of the weathering of the excavated soil before planting; but friable soils may be pitted and planted at the same time. Where the ground is dry, planting may be done about the end of the month; but damp soils are best left until the winter frosts have passed away, as they loosen up the newly disturbed ground, and endanger the vitality of the plants. Hares and rabbits should be rigidly excluded from young plantations. This is generally most effectually done by exterminating them from the neighbourhood of the plantings.

Mark timber for winter cuttings, and begin the thinning of plantations where the game may be disturbed with impunity; but where this may not be done, this work must be left until the shooting season has passed.

NURSERY. — Many hardwooded trees ripen their seeds at this time; and we may collect for the nursery acorns, berries, keys, and cones from Quercus, Platanus, Cratægus, firs, and other trees, and where the ground is ready they may be sown at once. Finish taking cuttings off evergreens, and commence taking off and planting deciduous cuttings. Ridge up vacant ground, and enrich exhausted patches by dressings of compost or well-rotted dung. Transplant hawthorn plants during dry weather, and other plants for their removal to the forest.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

IN this pre-eminently the best month of the year for tree-planting in the forest, as well as probably in any other locality, it is by no means rare thus to gain a year's growth by adopting it as the time for autumn planting. Let me give a single case in point. In 1859, the planting of an extensive enclosure on the Seafield estate in Strathspey, owing to the severity of the winter, had to be prosecuted mainly in autumn and spring. The ground in question slopes to the south, and extends from the bottom to the top of a hill for about half a mile, along which the planting was done up and down with a straight side as in regular planting, although not designed to be in lines. The comparatively straight lines of the autumn planting were so conspicuous at a great distance as to occasion remarks by even casual observers as to their superiority over their spring planted neighbours. As much planting as can be effected in autumn, though all planting cannot be then overtaken, should be done.

Prune hedges, remembering the claims of those bulking most prominently in the landscape. What is more attractive than a well-kept hedge?

In severe gales of wind which sometimes occur throughout the month, deciduous trees not yet defoliated usually sustain much injury. Though much damage is thus inevitable, trees which are moderately large may be lightened at their tops, and drawn up again, mechanically or otherwise, to their former erect position. After, if not during such gales, carriage drives, as well as public or private roads, should be cleared of incumbrances which may have accumulated on them.

Seeds of such species as are ripe should be gathered, and stored with great care lest they heat, which they have a tendency to do. Drains and ditches should also be carefully kept clear from constantly falling leaves; also raking them off the roads and drives.

Lifting plants in the nursery will this month be the chief occupation there.

Keep in proper state the fences and gates, seeing that the latter are in proper swinging condition.

The ravages of ground game must be guarded against as far as possible, and for this purpose R. Davidson's composition, or other appliance, should be freely used. Fine netting too can be used to great advantage, especially on single trees, by simply tying it full-tight round the stem close to the ground, and as high up as required. This should be done before the winter fully sets in, as a night's frost or storm may render a fine tree useless for ever, which might have been prevented by such timeous attention as here recommended.

Different kinds of work should always be ready to suit the kind of weather, and the men. This I would term gathering up the fragments of time, and it is quite surprising how many things may be done to great advantage by forethought, and outlook to have the men properly employed in bad weather.

C. Y. MICHIE.

CULLEN HOUSE, 17*th Sept.* 1885.

ERRATUM.—See page 338, last number of Journal, ninth line from top; instead of reading *cleaning vines*, read *clearing views*.

C. Y. M.

WALES.

THE chief forest work for the present month will be fencing, planting, and thinning of plantations.

Continue the preparation of ground for planting in the usual manner by clearing, draining, loosening the soil, etc.

Where the operations are extensive, the bare parts of the ground may be operated upon first, leaving the rougher ground with more herbage for frosty weather.

In favourable positions where the ground is naturally dry, or rendered so by thorough draining, planting may be commenced towards the middle or end of the month, as circumstances require. Planting done in the early autumn generally succeeds better than when done later on; while, where there is much to be done, planting may be carried on successfully during favourable weather from October to March inclusive.

Finish up the switching of hedges and pruning of forest trees. Young hedges may also be planted on well-prepared ground.

The thinning of fir plantations should now be proceeded with where not convenient to disturb the home plantations. Thinning operations may be commenced in the outlying districts.

Clear out open ditches and the outlets of covered drains.

In the nursery, seedlings may be transplanted in ground that has been well manured and cleaned. As plants are removed, the ground should be trenched and thrown up to receive the winter's frost.

LEWIS BAYNE.

KINMEL PARK.

CHIPS.

Government Planting Contract.—The Mexican Government has made a contract with Mr. Oscar A. Droege to plant 2,000,000 trees in the valley of Mexico within four years. The contractor pledges himself to 80,000 ash, 35,000 willows, 120,000 poplars, 60,000 eucalyptus trees, 60,000 trœnosjapones, 60,000 mountain cypress cedars, 60,090 acacias, and 120,000 of miscellaneous varieties. The trees must be in plantations of from 50,000 to 100,000 each.

Ventnor, Isle of Wight. — At Steephill Cattle, an *Araucaria imbricata*, about 40 feet high, has had nearly 40 cones, each twice the size of ordinary cocoa-nuts, this season. A *Chamærops Fortunii*, one of Robert Fortune's palms introduced from China, has been in full bloom throughout the season at East Dene, near Ventnor.

Wages of Farm Labour in the United States.—In 1866 an investigation was made to ascertain the prevailing remuneration of farm labour, whether employed by the year, the season, or during the hay or wheat harvest. The payment is reckoned by the month for the longer periods, and by the day for harvest work. Two usages prevail: payment wholly in cash, the labourer in one case providing his own board and lodging, and in the other receiving board as part of his compensation. The difference in the rate represents the assumed value of board, and differs according to the cost of living, being less in the west than in the east, and still less in the south. In the south the wages system is less prominent, though everywhere in use. The change from voluntary servitude in a large class of labour was naturally, and perhaps necessarily, attended with too much uncertainty, too wide a range of efficiency and value, for the cash wages plan; hence a system of share contracts were introduced, which still prevails to a considerable extent. It was found, in 1866, that the average for white labour was 28 dols. per month, and 15.50 dols. with board, this wide difference being caused by the high prices prevailing for food products, and especially for other expenses of living. An accepted estimate of thirty years before made 9 dols. per month, with board, the average cost of farm labour. An advance of 70 per cent. is thus indicated, much the larger part of it between 1861 and 1866. But this high rate was not to be fully maintained, as currency depreciated in value as prices fell and normal conditions returned. In 1869 the rate for labour paid fully in cash was 25.13 dols., a reduction having occurred in the west, some decline in the east, while in the south an advance had resulted from increasing efficiency in labour and rising confidence in its reliability. In 1875 a further decline had occurred; the reduction in six years being from 32.08 dols. to 28.96 dols. in the east, from 28.02 dols. to 26.02 dols. in the middle States, and from 27.01 dols. to 23.60 dols. in the west. The average rate with board was 12.41 dols., which is only 3.09 dols. less than in 1866. The difference was therefore more in the reduced allowance, and the reduction, though material, was less than it seemed. In the following period of cumulating effect of the depression, culminating in 1879, there was much labour unemployed, an excess of rural labourers, an abnormal reduction of wages, from which a gradual recovery resulted, which in 1882 had raised the rate nearly to the level of 1879, quite up to it in the western States. Thus during twenty years past wages were higher in 1866 than at the date of another inquiry, except on the Pacific coast and in the south. The decline continued to 1879, and amounted to 39 per cent. in the eastern States, 35 in the middle States, 30 in the western States, and 17 in the southern States. Wages have been best sustained in California, being now higher than in 1866. Comparing the rates of the present day with those of 1875, the decline is least in the west, being less than 6 per cent., 11 in the middle States, 12 in the south, and 13 in the eastern States and California.—*Rural Record.*

Forest Fires.—According to the *Timber World*, the loss to the United States through forest fires is now not less than 300,000,000 dollars a year, a sum equal to the interest on the public debts of all the civilized nations of the world, through the carelessness of boys and hunters. Locomotives should use spark arresters during the dry season, and underbrush from the woodland ought to be systematically removed.

FORESTRY

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NOTE.—*The Publishers regret that owing to changes in the Editorship, etc. of* "FORESTRY," *the present number has been delayed some days beyond the usual time of issue.*

EDITORIAL NOTES.

IN the September number of the *Indian Forester* we notice the "Brandis Prize for Sylviculture," which has been founded by the great Indian forester to encourage a closer study of the subject. A sum of £200 has been invested at 4½ per cent., and the interest on this sum "will be given annually for the best English essay on any subject connected with Indian Sylviculture by any past or present regular student of the Dehra Doon Forest School, or of any other Forest School in India." Here is a chance for Indian Forestry students to distinguish themselves.

A STRANGE OBJECTION TO THE PROPOSED SCHOOL FOR FORESTRY.—It is argued by some, we observe in the discussion on this subject that is being carried on elsewhere, that such a school would be apt to have the effect of turning out the pupils all of a pattern as if made to order. This might perhaps be the case if the individual capacity and other peculiarities of the different students counted for nothing in the forming of the ultimate results of tuition. If the students were all of one standard of intelligence and capacity, and were all endowed with the same nervous and physical peculiarities, uniformity or a pattern-like similarity of result might be expected at the end of the course of tuition. But where is this uniformity of the raw material to be found ? is it abundant or is it rare ? In any case, would not the selection of it from the mass of diverse individual humanity for the sole purpose of turning out a race of uniformly qualified foresters be an impossible task ? The objection is frivolous and ridiculous in the extreme. Why should uniformity and a pattern-like result be anticipated from the teaching of the proposed School for Forestry any more than from that of any other school. If it is held by those who urge this objection, that uniformity of attainment is the result of all tuition,—and they must in consistency do so, else their particular objection to a School for Forestry is absurd,—we must leave them to account for the immense diversity of individual achievement that is effected by professional and commercial men in their subsequent career, but who have been trained in the same school.

THE SWEET CHESTNUT A NATIVE OF BRITAIN.—This tree has hitherto been believed to be a native of Asia Minor, and to have been distributed over Europe and the British Islands in the progress of civilization. But in a recent number of the *Journal of Botany*, Mr. Ridley states that there are reasons for supposing that it was indigenous to Britain at a very remote period. Mr. Ridley's supposition is founded on the fact that he obtained from a brick-earth pit near Erith a piece of the wood of this tree along with flint-flakes and rhinoceros bones. The two latter relics point to a very remote past, but the coincidence of their being found in the same spot with a fragment of the wood of the tree in question will hardly be accepted in the absence of more convincing evidence, as proof that the tree flourished during the time in which the rhinoceros contended for possession of the earth with our flint-armed ancestors.

THE COMMON WALNUT (*Juglans regia*).—Although this valuable tree has been cultivated in this country from a very early period, all its uses do not appear to be generally known. Besides the high value of the timber for purposes of manufacture, and the general esteem in which the fruit is held either in the immature state in the shape of pickles, or when ripe as a toothsome nut, the sap of the tree yields an excellent sugar in the spring by tapping the stem in the manner in which the birch and the maple are tapped in Canada, the latter for sugar, the former for wine. The yield is not large, only about two and a half pounds of sugar to a hundred pounds of the juice. Wine is also made from the juice thus obtained under fermentation. The kernels of the nuts contain nearly a half of their weight of a white sweet-flavoured but inodorous oil, which is in many parts of Germany extracted and used for many purposes, formerly even being used as a substitute for butter; but as it rapidly becomes rancid, its use for that purpose is naturally limited. In some countries an infusion of the leaves is regarded as an excellent cure for itch and scrofula and many other skin diseases, and the same infusion mixed with grease is said to be an excellent hair restorer. Such are a few of the not generally known virtues and uses of the common walnut tree, but unfortunately the tree is not without its bad repute. By some old authors it is said to be dangerous to sleep or sit under its shade, that it causes fever and coma; there does not seem to be any direct proof of this beyond the commonly-known fact that the strong odour of this tree, when long endured by some, causes headache.

THE ADIRONDACK FORESTS.—As showing the deep interest that is being manifested in the United States on all matters bearing on the condition of the natural forests of that country, we note that a report has been presented to the Agricultural Department of the State of New York on the present condition of the forests of the Adirondack plateau. These forests, it appears, have been treated in the same recklessly wasteful fashion that has been the common practice in all other parts of the United States. The Adirondack region is not adapted for the ordinary operations of agriculture, but is admirably so for forestal development, and it is recommended by the Commissioners that what remains of the forests should be carefully preserved in the commercial interests of the State. Proof has been obtained by the Commissioners "that the flow of the rivers has decreased from 30 to 50 per cent. within the memory of living men, while the damage from spring floods and summer droughts is increasing," and these disastrous results are clearly traceable to the wasteful destruction of the great forests named.

ARBOR DAY IN AMERICA.—The practice of tree-planting by private individuals and associations has been taken up with much energy in the United States, and is likely to result in widespread public benefit. In Ohio, a State Forestry Association which has been taken as a model for similar associations in other parts of the country, has been organized for the purpose of stimulating and developing public interest in arboriculture. The State Legislature has taken up the matter, and in 1883 a Government proclamation was issued setting apart the fourth Friday in April of every year as a public holiday to be called Arbor day, and to be devoted to the systematic planting of trees and groves in all suitable places. These measures have been rendered especially necessary in Ohio, where neglect and destruction of the forests have been allowed to continue for many years. It is intended that the State Forestry Association shall form the centre of forestry associations in every city, town, village, and school in the State, whose object shall be to plant trees along the streets, by the roadsides, in parks and commons, around public buildings and in waste places, to distribute information respecting trees and forests among the people, and to encourage tree-planting in every possible way. The celebration of Arbor day forms the subject of an interesting pamphlet issued by the Department of the Interior at Washington, in which is to be found much information, both practical and historical, and a valuable letter by the late Dr. Franklin B. Hough. Our Transatlantic cousins, from the Government to the people, are happily more alive to the national advantages of arboriculture than we are. But we are waking up.

GOOD USE FOR TREES.—A portion of the report of the Woods and Forests Department of South Australia is devoted to the interesting subject of planting railway lines and station yards. What reader will not wish with all his heart that the report applied to his own country ? Whatever can be said in favour of railroads—and surely enough has been said in their favour to entitle the other side to an occasional innings—they are, to say the least of it, the very abomination of ugliness—hideous in themselves, and the cause of hideousness wherever they go. Yet, to judge from South Australian experiences, there is no reason why nature should be unable to protect herself to a very considerable extent from her omnipotent invader. Experience has already shown that the trees hitherto planted have flourished,—at one place to the extent of 85 per cent. of those planted; and the general success has encouraged the Government to spend a further sum of over £1000 upon continuing and extending operations generally. Altogether 15,000 trees are successfully engaged in the work of hiding or only less effectually adorning the lines and stations. Unquestionably a grove of Eucalyptus, Pinaster Tamarisk, or Cedar—some of the varieties enumerated—must be considerably more pleasant for the eye of the passer-by to rest upon than an altogether unveiled heap of apparent litter, or even than that forlorn and pathetic would-be oasis, the station garden. Probably also the health of those ghastly territories, the railway suburbs and slums, would be rendered far more healthy and habitable, as well as less unsightly, by becoming centres of arboriculture. The worst of the matter, however, is that it costs money; and we fear that British railway companies are not so far advanced in their ideas as the Government of South Australia.

MAHOGANY CULTURE IN INDIA.—Great attention is, we learn from the report of a meeting of the Committee of the Agri-Horticultural Society of Madras of February last, being given to the introduction of mahogany (*Swietenia Mahogani*) into India. There are many trees of considerable age already in various parts of the country, and although the climate is very different to that of its native habitats in the West Indies, it appears to thrive admirably, and to make timber of first-rate quality. The timber of some trees blown down in the cyclone of 1864 in the Botanical Gardens, Calcutta, is said to have brought " extreme prices." The tree appears to be easily established, but numbers are difficult to procure, owing to the scarcity of seed, and the fact that it does not long retain its vitality. It is not a free bearer of seed even in its own country, and in the

Botanical Gardens, Calcutta, the production of seeds is very limited indeed, so that the power to distribute plants is necessarily small. Seeds are being imported from the West Indies; but they rarely arrive in good condition, owing to the lengthened time required in transit and the low vital power of the seeds. This may be overcome in time by better modes of packing the seeds and by more expedition being used in transit. Propagation by layers and cuttings has been resorted to with fair success; but the trees so raised, it appears, do not thrive so well as those from seed, and the timber, it is said, is not nearly so good in quality. But we find from another part of the report that trees from cuttings and layers planted in the Botanical Gardens, Calcutta, 56 years ago have now "trunks varying from 7 to 10 feet in girth." Dr. Anderson, of the Calcutta Botanical Gardens, believes the tree may be established as freely over all parts of Bengal as the larch has been in Britain, as it appears to grow well in all varieties of soils, and the general climate suits it well.

TREE IVIES.—Our readers who have cultivated these useful evergreens will be interested in reading the following remarks appearing in a contemporary under the signature of "E. H.":—"About four years ago I bought a collection of tree ivies, and they have now developed into very handsome bushes. Perhaps it is hardly right to call them trees, but in the course of time, and with a little help in the way of training, they may some of them assume an arboreal character. They will be found very useful in suburban or town gardens, as they are as hardy and vigorous as the common ivies from which some of them have probably sprung, as is shown by a stray shoot now and then being put forth which has a tendency to climb. They are easily propagated by means of cutting, and are now cheap enough for all to plant them. The varieties which I have are *Hedrea aurea maculata*, *Baccifera lutea* (yellow fruited), *Canariensis* (Irish), *Canariensis variegata*, *Marginata argentea* (pretty silver-leaved variety), *Regneriana*, *Palmata*, and *Tricolor variegata*. The last-named and *Marginata argentea* are two prettily variegated ivies, of erect growth. They progress rather slowly at first, but when well established they grow more rapidly."

AMERICAN FORESTRY CONGRESS.

THE fourth annual meeting of the American Forestry Congress was held at Boston, Mass., under the auspices of the Massachusetts Horticultural Society, on September 22 and three following days. The local arrangements were conducted by a committee of which Mr. William C. Strong of the Horticultural Society was chairman. The President, Mr. Warren Higley, of New York, delivered an able address on the aims and objects of the Congress. Many valuable and interesting papers were read and discussed by members from all parts of the States, all of which will no doubt in due time be published to the world. The paper read by the Rev. N. H. Egglestone, Chief of the Forestry Division of the Department of Agriculture, on "The State of Forest Legislation in the United States," revealed in a striking manner the necessity for immediate and stringent intervention of the Legislature not only to prevent the wholesale waste of forest products, but also to repair the damage done to the national interests by the encouragement in every way of forest extension. Here are some of Mr. Egglestone's facts and figures in regard to the forests of the United States and the rate of consumption they were at present undergoing. He says "the census gives the amount of lumber cut in 1880 as 18,000,000,000 feet. Last year the cut had increased to 28,000,000,000, which would lay bare an area of 5,600,000 acres, equal nearly to that of New Hampshire." Altogether it appears that the forests of the country are subject to annual drains of 50,750,089 acres, which clear a wooded surface equal in extent to the area of all the New England States together with the small States of New Jersey and Maryland. Little wonder that the Congress proposed the appointment of a Committee on Forest Legislation, with ex-Governor Morton, of Nebraska, at its head, to draft suitable laws both national and State for forest conservancy. In every way the meeting appears to have been a very successful one, and will no doubt do much to intensify the public interest, which is already strongly attracted to the vital subject of forest preservation.

ENGLISH ARBORICULTURAL SOCIETY.

EXCURSION TO ROTHBURY.

On the occasion of their Second Annual Excursion, which took place on Friday the 2nd ult., the members of this young and vigorous Society, favoured with pleasant weather, visited Cragside, Rothbury, the princely residence of Sir William Armstrong. They left Hexham by an early train and breakfasted at the Douglas Hotel, Newcastle, where they were joined by the members of the Newcastle and Carlisle districts. Breakfast over, the company proceeded by the 8.20 A.M. train to their destination, *via* Morpeth, where their number was again increased by the accession of a few of the northern members of the Society. Arriving at Rothbury at 10.30 after a pleasant journey through varied rural scenery, the excursionists made tracks for Cragside, where, through the courtesy of Sir William Armstrong, they were granted admission into his extensive domains. Before reaching Cragside, they were met by Sir William's land-steward and manager, Mr. W. Bertram, by whom they were conducted over the grounds. The first object of interest was the American garden, through the whole of which the company were allowed to pass. Some time was here spent in examining one of the finest collections of conifers it has ever been our privilege to see. It included *Retinospora plumosa aurea*, 8 feet high and 20 feet round, in grand colour and perfectly symmetrical shape; *Retinospora plumosa*, 8 feet high; *Retinospora squarrosa*, 9 feet high. Here and there amongst the conifers were conspicuous spikes of *Hyacinthus candicans*, which enhanced the beauty of the groups. *Kalmia latifolia*, with beautiful green foliage, was planted at edges of groups. *Juniperus chinensis aurea Youngii*, 3 feet, is a most distinct golden variety of recent introduction. *Thujopsis dolobrata*, in two distinct forms, attracted much attention, and were pointed out by Mr. Bertram as being planted for the same variety some years ago. A very fine specimen of *Cryptomeria elegans*, 9 feet high, and of graceful shape, stands at outside of glass shades, proving the hardiness of this conifer, which a few years ago was destined to be for glass culture only. In Japan the *Cryptomerias* are called timber trees. Alongside the specimens mentioned, and under covered walls, are many choice creepers, comprising *Aristolochia sipho* and *Ceanothus azurea* in full bloom, the latter being a distinct variety having beautiful pale-blue trusses of flowers.

In another section of the garden we observed noble specimens of

Retinospora obtusa aurea, 7 feet high, and of a clear golden hue, and a magnificent specimen of *Retinospora obtusa* not less than 10 feet in height. The company seemed greatly interested in some grand specimens of the beautiful golden cypress—*Cupressus Lawsoniana lutea*—and other golden conifers too numerous to mention. They also inspected with interest *Thuja vervæniana,* 9 feet by 18 feet; *Biota elegantissima,* 6 feet by 8 feet; *Thuja Elew-angeriana,* 6 feet by 18 feet, all of which are grand specimens, and in fact were acknowledged by many of the professional nurserymen present to be unequalled anywhere. Leaving this portion of the ground, the company were conducted by way of the roseries, and ascending the terraces were much struck with the handsome specimens of variegated hollies, which seemed to be quite at home and in splendid character.

The fruit houses—100 feet by 24 feet—which are divided into three apartments, one containing figs in full fruit, and another with apricots, peaches, nectarines, and mulberries in full fruit, and all in fireclay pots set on pivots, in order that they might be easily turned or removed to any of the other houses. The flower garden was next inspected—two grand specimens of variegated American Agaves were in the centres of beds—of beautiful geraniums, etc., dahlia (glare of the garden) being in full bloom, while others were blighted with the recent frosts. The conservatory was one blaze of bloom with creepers hanging in profusion from the roof, consisting of Taxonias, passifloras, fuchsias, etc. Passing into the fernery, we notice the grottoes laden with variegated Begonias, also *Todea superba* in great quantity, and a very fine collection of hybrid Todeas raised by Mr. Hudson, the energetic gardener—a cross between *superba* and *Pallucida.*

The conservatories and fernery attracted considerable attention and were very much admired; from this the grounds were entered by way of a broad path leading to the picturesque ravine in front of the mansion-house, where groups of *A. Douglasii* seem growing in all its splendour, many reaching 30 feet in height. There are also *Picea nobilis glauca,* 40 feet high, covered with large cones; *Picea Nordmanniana,* 35 feet; and *Cupressus Lawsoniana,* 25 feet, all of which were planted twenty years ago. Near the bottom of this beautiful glen there are many fine clumps of *Cornus sanguinea* (the red dog-wood). At this point an elegant iron bridge spans the Debdon burn, and the view obtained from the centre of the bridge is exceedingly grand, a lovely lake and waterfall being prominent features of the scene. Proceeding down the side of the burn, the conifers seem to grow like willows, especially the *Picea pinsapo* and *Picea. Nobilis glauca* is to be seen here in groups, with grand silvery foliage; also *Thujopsis Borealis compacta*, nearly 20 feet in height, planted alongside *Picea Lasiocarpa*, 30 feet. We next crossed a stone bridge of Roman architecture covered with ivy, and viewed another gorgeous if less conspicuous waterfall, a scene which would baffle the finest artist to exaggerate. Amongst the jutting rocks we noticed clumps of *Polygonum japonicum*, and a grand clump of *Euphorbia angustifolia*. On retracing our footsteps, we were confronted with attractive Ericas and dwarf Rhododendrons, Kalmias, Andromedas amongst the rocks, to which the stately conifers formed a magnificent background. *Abies Hookerii*, a beautiful glaucous conifer, is also here amongst the rocks in splendid character.

The company then arrived at the entrance to the noble mansion, and were conducted through the gallery with its fine paintings, and the grand drawing-room, prepared last year for the reception of the Prince of Wales. Both were very much admired, particularly the grand marble fireplace in the latter. All over the house electric light is fitted, so that by touching a small switch the light is momentarily produced. After this a more extended inspection of the grounds was obtained, the arboriculturists expressing the utmost satisfaction at the general appearance and condition of everything. Proceeding along the side of the crag, and ascending the top of the hill to the right of the carriage-drive, the landscape widened and became more impressive than ever. Besides rocky glen through which we had just passed, flamed in all its brilliant tints, it embraces several lakes, a wide stretch of barren moor and fertile valley, and the reviving yet ancient and historical village of Rothbury.

Another lake, sleeping in silence on the top of the hill, with its heath-clad margin studded over with a miscellaneous collection of conifers and other beautifully-coloured plants, was the object of much admiration. A short halt was made, after which we descended through the grounds at the rear of the mansion, where Andromedas and Gaultherias, covered with berries, appear in abundance. We were then conducted through the store, from which the electricity supplied to the house is stored, and numerous batteries were charged in readiness, lest by any means the power of daily manufacture might fail, and the supply of electricity suddenly become deficient. Two whole nights' light can be stored in this way. The company then visited the sawmills and joiners' shop, where electricity is also used in many different ways, and by giving warning by way of an electric bell, the whole of the machinery was put in motion. The work was particularly interesting to the many foresters present, who seemed keenly concerned in the arrangement and working of the various machines. Before leaving this, Mr. T. P. Dods moved, and Mr. Watt seconded, that a hearty vote of thanks be accorded to

Sir William Armstrong, through Mr. Bertram, for kindly giving them permission to view the beauties of Cragside.

Since Sir William entered into possession of the grounds, some twenty-one years ago, about 1400 acres have been planted, and during the last three years on an average 250 acres per annum have been put under wood. Some idea of the extent of the operations may be gathered from the fact that last season one firm alone—William Fell & Co., Hexham—supplied 300,000 transplanted Scotch firs, while 10,000 rhododendrons were planted recently from the famous Derbyshire nurseries.

The success which has been achieved at Cragside in the cultivation of forest and ornamental trees is no doubt attributable to the superior judgment and skill manifested by Sir William, supported by his manager Mr. Bertram, in the selection of plants and trees suited to the soil and climate, and in the careful planting of the same. Everything seemed to be growing vigorously, including the Turkey oak recently planted by the Prince of Wales.

The party then returned to the village, where they partook of a capital dinner, served at Mr. Lawson's Queen's Head Hotel. Mr. T. P. Dods, vice-president, presided, and Mr. Davidson acted as croupier. Amongst those present were — Mr. T. P. Dods, Hexham; Mr. W. Fell, Hexham; Mr. J. R. Brown, Hexham; Mr. M. Jewitt, Healey; Mr. Edw. Jewitt, Healey; Mr. Watt (Messrs. Little and Ballantyne) and Mrs. Watt, Carlisle; Mr. Havelock, Hexham; Mr. John Luke, Hexham; Mr. J. W. Robson, Hexham; Mr. J. Smith, Haydon Bridge; Mr. Bowmaker, Naworth Estate Offices; Mr. Barnard Cowen, Westoe, South Shields; Mr. and Mrs. Doughty, Canonbie; Mr. J. Wilson, Leazes Park, Newcastle; Mr. Wm. Fleming, Tudhoe, Durham; Mr. D. Smith, Berwick; Mr. Dodd, Blagdon; Mr. Macdonald, Office of Forestry, Edinburgh; Mr. Bertram, Cragside; Mr. Elliott, Jesmond Dene, Newcastle; Mr. Gilbert, Blagdon; Mr. H. Hudson, Cragside; and the secretary (Mr. J. Davidson, Haydon Bridge). The dinner over, the Chairman proposed the usual loyal and patriotic toasts, which were duly honoured.

Mr. Watt then proposed the health of Sir William Armstrong, to whom all present were so much indebted—a toast which was drunk with enthusiasm.

Mr. T. P. Dods proposed "Our noble selves—the English Arboricultural Society." He must say that two years ago, when their secretary (Mr. Davidson) spoke about setting the Society afloat, he was very doubtful about the project; and yet, from that time, they now numbered 120 members. He need not say that a great deal of that success was due to the energy with which Mr. Davidson had wrought on their behalf. Mr. Davidson had been diligent, and intelligently diligent, in advocating and pushing the claims of the Society, and he was glad to notice that the number present at that excursion was nearly double that which attended last year; and he hoped that next year they would be doubled again. He also hoped that their excursions would always be as pleasant. Their pleasure was greatly due, in the first instance, to Sir William Armstrong, and in the second place to Mr. Bertram, who had so kindly shown them over the whole place. He coupled the toast with the name of their secretary.

Mr. Davidson, in replying, said it was certainly gratifying that the Society was making such progress. Theirs was a beginning of very recent date, and there had been a good deal of hard up-hill work. Landed proprietors generally looked with rather a suspicion on that congregation of foresters and nurserymen. They had erroneous ideas as to the character of the Society, but they were now beginning to see by the progress of the Society scientifically, and such excursions as that of that day, that the Society meant real business. They meant to go on, not only seeking to benefit foresters and nurserymen, but the whole country at large. There was great need for such a society. The science of forestry should be spread in every direction, especially in our own country, if it were for nothing more than to protect us from the winds that were sent to us from America. He hoped that what they had seen that day of the efforts in that direction would induce other proprietors to follow the example of Sir William Armstrong.

Mr. Watt asked permission to make one remark. At a previous meeting a valuable paper was read by Mr. Baty. Many people thought that Mr. Baty's returns were overstated; but in the company that afternoon was the representative of a ducal proprietor, who during the last twenty-five years had handed the owner nearly £100,000 for wood, or 30 shillings an acre per annum over the whole period, for land which otherwise was not worth half-a-crown an acre. He thought those figures very interesting and worthy of publication.

The health of Mr. Bertram was proposed by the secretary, and briefly acknowledged; and "The Press" (proposed by Mr. Doughty, and responded to by Mr. Macdonald) and "The Ladies" terminated the day's proceedings, which seemed highly productive of pleasure to all.

ROSS-SHIRE FORESTRY.

IN your July issue, I notice a few remarks by Mr. D. Robertson, forester on the Novar estates in this county, on my reference to the woods of that property in a general report, made by me to the Highland and Agricultural Society in 1883, on the woods in the counties of Ross and Cromarty. Kindly permit me to furnish readers of those remarks with a few particulars on the points they refer to, in their order.

Mr. Robertson begins correcting my estimate of 2000 as the acreage of Novar woods by stating that there are now 4000 acres under wood! What area has been planted since I visited the woods in the summer of 1883, Mr. Robertson does not say; but I submit that on any property, especially on Novar, where large tracts of wood occur together, it is next to impossible to gauge the acreage approximately, therefore on this point I generally made inquiry of estate officials, always with the exception of Novar receiving a ready reply! I think it is only right to explain here, that Mr. Robertson was duly made aware that some notice was to be taken of the Novar woods, and further, that his reply to a request, made through a friend of his own, to kindly give any such information as he thought proper, was, that he (Mr. Robertson) had not time to do so, and besides did not think his employer would be pleased at him giving any report whatever! I do not complain of this, but surely it is a little inconsistent of Mr. Robertson to refuse information for a public report, which he can now see fit to publish to the world in the way he has done, and with no objection this time from the employer! Failing then to get Mr. Robertson's assistance, and not caring to inspect the woods unaccompanied by any estate servant, I engaged a man who, I was informed, had assisted in the planting, cutting, and carting of wood on Novar for a number of years! Two thousand acres he considered a safe estimate of the acreage, which, after due inspection of the woods, and an after reference to the Valuation Roll, I considered near the mark.

The total sum there returned as the grazing value of Novar woods is £92, 5s. This at say one shilling per acre, would only give 1845 acres as returned at all, and would leave my informant approximately correct at 2000! But Mr. Robertson says there are 4000 acres of wood, which means that 4000 acres are returned at £92, 5s., *i.e.* at the rate of 5½d. per acre. This being so, is 5½d. not a very inaccurate and low return of the ordinary grazing value of Novar woods, even allowing something off for the great extent assessable! I may mention that on this estate the return made that year for about 750 acres of wood ranging from 8 to 60 years old, and situated at altitudes varying from 150 to 1000 feet above sea-level, is £95, 10s., or at the rate of over 2s. 6½d. per acre!

Mr. Robertson's second remark is also a question of acreage upon which of course he could have given more precise information if he chose at the time! My informant gave it as stated, which, looking at the undulating nature of the ground, I thought approximate.

Regarding the next statement about the kinds and comparative sizes of the different trees near Newton, I regret if I have inadvertently confounded the exact boundaries of the Balconie property with the fields of Newton, and also that I omitted to make special note of the hollies in which Mr. Robertson takes such a just pride!

After speaking of the splendid growth of the larch and fir and the "large-sized hardwoods," I mention that "Novar House stands among a few ornamental trees and some more hardwoods." Mr. Robertson finds fault with me here for not specially designating the hardwoods, and many fine old larch and fir as "ornamental." I need merely state that I used the term as it surely should be applied to trees, viz. those introduced for purposes of decoration, and not with the view of profitable timber-rearing as a whole! Of these there are at Novar, as Mr. Robertson asserts, cedars, Wellingtonias, Picea pinsapo, Abies Menziesii, Cryptomeria Lobii, etc. It must be very gratifying to Mr. Robertson to be able to give such measurements as he next quotes.

My report states that I "understand that seed has been collected in the Novar woods, but that it is not the custom on this estate to grow home seedlings." I was told this while standing in the Assynt nursery, and it is another point upon which Mr. Robertson could have given correct information. Mr. Robertson's experience of the best age of fir tree to grow from is interesting!

Mr. Robertson next disputes my estimate of the acreage planted within the last 80 years, and now comes forward with the information that in that period several hundred acres more have really been planted.

The only way in which I can account for my statement that a "plantation has been formed below Menocrock" being wrong is, that the plantation I passed through is situated under a continuation of Menocrock, which goes by a different name. These names are of course merely local, and I cannot accept responsibility for the boundaries indicated by them, as they are easily convertible according to convenience.

A reference to my report is all that is required to correct Mr. Robertson's next remarks, as he has evidently misunderstood what I said. It will then be seen that I praise the larches in Dhalgheal wood, south of Menocrock Hill, not the larches in Menocrock wood, as Mr. Robertson says. I state that Dhalgheal wood, not Menocrock wood, "grows on a black loam above blue clay on the lower or south side, and a light gravel overlying conglomerate on the higher ground, *i.e.* the part rising on the Menocrock Hill." A road runs through this Dhalgheal wood, "immediately above which the Menocrock Hill rises steeply. Here it is that some of the very finest Scotch fir in the north are to be seen. Below this road the ground is level, and the Scots fir have not done so well; indeed, the size of the larches here, *i.e.* in Dhalgheal wood, as afore mentioned, is surprising, considering that the soil is very wet and requires drainage badly." I fancy drains were being cut in the blue clay not 400 yards off when I visited this place!

Mr. Robertson, in again finding fault with the comparative terms I was compelled to use, owing to the absence of reliable reference regarding the acreages, adds that a wood which appeared about 40 years old, and which my guide said was certainly about that age, was really 103 years old! This he follows up by acknowledging my next statement that a good many props were cut out of that wood 16 years previous! Props, in fact, according to Mr. Robertson, 87 years old! Trees surely little needing mention!

A good deal of timber was cut when I visited the Fyrish woods, and my guide informed me that in the far off, *i.e.* the northern portion of the wood, two or three engines were then at work!

Notwithstanding contradiction, I am aware that a very large quantity of Novar timber has been sold for some years back, and properly so, for much of the timber is mature! Doubtless, therefore, Mr. Robertson is well able to speak now of a seller's experiences, but I am hardly inclined to accept his figures for buyer's average profits during the period my notes cover. In making up the few general notes I added to my paper, on the average prices of Ross-shire timber for 15 years prior to 1883, I was careful to consult timber merchants and manufacturers who are extensive purchasers of Ross-shire wood. All will agree that we may safely rely on their figures and their experience, which has the advantage of representing prices from various points, not from one estate only. Ten years ago, they inform us, they paid 1s. 10d. and 2s. for best larch for ship-building. This could, as I stated, be had in 1883 for 1s. 6d. or 1s. 3d. per cubic foot. If sale has to be made immediately, and it is convenient to get rid of large quantities, as for instance for railway sleepers, it is correspondingly cheaper; inferior qualities and sizes of course being lower still. Good fir rose as far as 1s. at one period within the last 15 years, but has gone down again.

W. F. GUNN.

STRATHPEFFER, ROSS-SHIRE, *September* 1885.

THE INTERNATIONAL FORESTRY EXHIBITION IN EDINBURGH: AN ARGUMENT FOR THE ORGANIZATION OF A NATIONAL SCHOOL OF FORESTRY.

BY THE REV. J. C. BROWN, LL.D.

Read before the British Association at Aberdeen, 1885.

APPARENTLY the International Forestry Exhibition held in Edinburgh gave great satisfaction to multitudes. It gave to many new conceptions of what is comprised in *Forestry*, as that term is now being applied. To quote words which I know to have been used, they expected, perhaps, to find "lots of logs and deals and bundles of sticks inside the building; and large trees, far larger ones than could have been easily transported thither and planted there, growing outside;" all that, but little more. The Exhibition presented to many, as they advanced along the nave and transepts, what was productive to them of surprise as well as of delight, and well it might be. Never before had there been collected under one roof, such exhibitions of forest produce as were to be seen there, collected from Japan, from India, from Johore, from the Cape of Good Hope, and from British Guiana, etc.; each of them, perhaps, a collection previously unequalled.

But now that time has sufficed to cool down any extravagance of feeling which may have manifested itself while the Exhibition was still open, we can afford to glance at defects in the Exhibition, with no design to depreciate that enterprise, but with a desire to learn something which may do us good, by the consideration of what *was not there*, along with the consideration of what *was there*. My own feeling on the opening of that Exhibition, and on many visits which I subsequently made to it, was one of disappointment, combined with admiration and delight.

For half a century and more there has been in operation on the Continent of Europe, and in the latter portion of that half-century in almost every country on that Continent, — I know of no exception,—a method of forest conservation and exploitation known in Germany as *die fachwerk Methode;* in France as *la methode des compartiments;* in other countries by one or other of these designations; and in others as the *scientific method*, that is to say, of managing forests. It is the one method which has given its character to the present era of forest economy. But scarcely was there to be seen an indication of this fact having received any consideration by those to whom we are indebted for that Exhibition, either as exhibitors or otherwise. I find no difficulty in accounting for this being the case; and I direct attention to it solely with a view to founding on it an argument for measures being taken to secure greater benefits from our Crown forests in various lands, and from forests in private hands at home and elsewhere.

In order to the satisfactory enforcement of that argument, it is necessary that I should carry my readers along with me, with definite ideas of what the things spoken of are; and in view of advantages to be obtained from this, I crave the indulgence of those who may be as well acquainted with all these matters as I am.

Most of us know something of arboriculture; and perhaps as a nation we are surpassed by none other in our arboriculture. But where forest economy in accordance with the advanced forest science of the day is practised, it is not arboriculture, but *sylviculture*, which commands the attention of foresters. The two are intimately connected. The difference may be illustrated thus:—In arboriculture, or tree culture, the unit commanding attention is the tree,—and thus, it may be, the trees of which the clump, the wood, or plantation is composed; and the clump, or wood, is only considered as a collection of these. In *sylviculture*, the forest or plantation is the unit which commands attention, and the several trees of which it is composed are only viewed as constituent parts of it: the sylviculturist looking upon the several trees very much as the arboriculturist looks upon the several leaves or branches of the trees to which he is giving attention.

Illustrations crowd upon me:—The body of man is a composite structure, built up of cell and cell walls; each of these has or has had its life history, and the health of each and of all is necessary to the perfect health or well-being of the whole. And in the division of labour which is seen in the prosecution of science there are men who, without losing sight of the truth I have stated, give their attention to the study of the origin, life, growth, reproduction, death, and decay of cells; while there are others who, without losing sight of these, give their attention to the phenomena of some one or other of the phases of the life, growth, reproduction, decay, and death of the corporate body, or of some one or more of the organs developed in its structure. The former find their representative in the arboriculturists; the latter in those who give themselves to the study and practice of sylviculture.

M. Guinier, in an exhaustive article on the *Furetage* of the beech in the Pyrenees, in the *Revue des Eaux et Forêts* for 1843,[1] adduces an illustration of his subject, of which I may with advantage avail myself here. The term *Furetage* is applied to a method of exploiting coppice wood, in which shoots which may be deemed fit for removal are ferreted out; as in timber forests, trees here and there are felled in accordance with what is known as *Jardinage,* from its resemblance to the procedure of a gardener in gathering only here and there matured vegetables. Having given details of an improved method of procedure with coppice-wood, which does not immediately concern us here, he proceeds :—

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[1] Cited at some length by me in a volume on *Forestry in the Mining Districts of the Ural Mountains.*

"Let us compare now the spirit of the method proposed with that of the old system of *Furetage,* and cast a glance at the general results of the two methods of procedure.

"One can establish easily two essential differences.

"In the old *Furetage* each shoot was considered individually; and the necessary precautions were taken to secure the life of the stump, and the prosperous growth of the shoots to be obtained. Further, the shoots in a dominant condition were exploited, and the dominated shoots were reserved awaiting the attainment by these of a maximum of dimensions which was variable.

"On the contrary, by the employment of the proposed formula:—

"The consideration of each shoot separately is abandoned in favour of the consideration of the prosperity of the crop in a mass. This method of looking at the subject is conformable to the modern and generally adopted method of attending to the culture of woods, the prescriptions of which relate to forest masses, and not to the trees individually. It is thus in the manœuvring of a *corps d'armée,* or of a battalion, or of even a platoon of soldiers, the individuality of the soldier is effaced. Attention to be given to the development of each subject pertains to arboriculture, whilst it is the development of the forest mass which is what pertains to sylviculture."

It is what is said in the continuation of the preceding paragraph which illustrates the point.

M. Guinier discusses the matter in all its details; and he states at what places in France *Furetage* is practised, and the extent to which it is there carried out. But upon these discussions and statements I do not feel called upon to enter.

Similar to this is the technical difference between arboriculture and sylviculture, of which alone we hear on the Continent, for attention there is given primarily to the culture of woods and forests, and only in subordination to this to the requirements on individual trees.

But this explanation has been given only as a preliminary statement. Connected with this sylviculture,—it matters not to our argument whether it be as cause or as effect, or as a consequence of a common cause,—is the modern system of forest management of which I have spoken. By this there are secured, simultaneously, a natural reproduction of forests, with a progressive amelioration of these, and a sustained supply of forest produce, and each of these as satisfactorily as if it alone had been the object which the forester had in view. We are familiar with the form of the cells in a honeycomb, each of them a hexagonal tube, terminating in an apex with three facets, and so arranged that the six sides of any one cell, say of every cell, constitute the sides of six other cells, while the three facets of every cell constitute facets of other three cells—with the result that the saving of material, saving of labour, and saving of space is as complete in the case of each as if that had been the sole design of the arrangement. So are the three objects mentioned—natural reproduction, progressive amelioration, and sustained production—secured in modern forest economy. Now of this scarcely was there to be seen in the Exhibition an indication of its having received any consideration by those to whom we are indebted for that Exhibition.

There were, indeed, indications of this method of exploitation, which is followed universally on the Continent, being practised,—such indications as may be likened to the first appearings of dry land here and there above the waste of waters, when dry land first emerged from the globe-encircling ocean ; and they were to be seen where perhaps the visitors would have least expected to meet with them,—in the wonderful collection of objects sent from Japan ; in the scarcely less wonderful, and perhaps more striking, collection of objects brought from India ; and in one or two of the collections exhibited from Denmark. I have no recollection of seeing anywhere any others.

There were no maps, charts, diagrams, or forest products illustrative of forest management in Sweden, Finland, Russia, Hungary, Austria, Croatia, Greece, Bavaria, Wurtemberg, Baden, Hesse, Saxony, Bohemia, Silesia, Prussia, Hanover, France, Switzerland, Spain, Portugal, or Algiers : though in each of these countries there is presented a distinct and different phase of forest economy, and in many of them such distinct and different phases of the most advanced forest economy of the day.

I do not state this to disparage that Exhibition. I glory in that Exhibition, and in results which have already manifested themselves, and in still greater and far-reaching results which I hope are yet to follow. I have made the statement solely with a view to make intelligible another statement which I am about to make, which is, that I consider that Exhibition a fair representative of the forestry of Great Britain, both in its magnificence and in its defects, producing beautiful and admirable woodlands, which so satisfy all our British cravings, that the forest economy, founded on the most advanced forest science of the day practised on the Continent, is ignored, if it be not altogether unknown. It was an Exhibition of British ideas of forestry; and to this extent an Exhibition of the forestry of the present,—of the present and the past, let us hope, not of the present and the future,—a point of departure marked by a grand display of attainments made, which may serve as a standard of comparison to which to refer attainments in the practical application of modern forest science which may be made in the future, whether the near or the more remote.

With remarkable accord has it been declared by many that the organization of a National School of Forestry would be a natural outcome of such an Exhibition. It was "in the interests of forestry, and to promote a movement for the establishment of a National School of Forestry in Scotland, as well as with a view of furthering and stimulating a greater improvement in the management of woods in Scotland and the sister countries, which has manifested itself during recent years," that arrangements for the organization of the Exhibition were entered upon; and the Exhibition has, in the way I have indicated, as well as in other ways, made more apparent the need that exists for such a school.

I have spoken of the correlated advantages resulting from the management of forests in accordance with what has been called in some countries the scientific method—natural reproduction, progressive amelioration, and sustained production. In enforcement of the argument upon which I have entered, I may take now another step in advance, and state that while these results are secured, every operation in the forest, from the lopping of a branch and the cutting of a sapling, to the felling of a tree and the clearing of a forest patch, in a well-administered and efficiently managed forest, is so ordered and carried out as to subserve the accomplishment of these objects; and this can only be effected through forest administrators, and forest officials entrusted with the operations prescribed by them, being extensively acquainted with forest science.

In the forest literature of the Continent we possess an immense body of collected data and scientific treatises prepared and lying ready to our hand. But very few of our foresters can read Latin or French or German, or Swedish, Spanish, or Hungarian, all which languages are rich in forest literature. Truth is said to lie at the bottom of a well. It may be so; but the well is deep, and many have nothing to draw with; and, moreover, on the Continent, in almost every country—I know not an exception,—including those which are rich in forest literature, it is deemed expedient to educate and train to observation and study all candidates for employment in the management of State forests, and this is rigorously required. In most countries the prescribed curriculum of study is as comprehensive as that prescribed to students of medicine in this country, and much more comprehensive than those prescribed to candidates for the pulpit or the bar, and corresponding status and salary are enjoyed by them.

It is chiefly the requirements of British colonies, and of lands similarly situated, in order to the conservation, the economic exploitation, and the extension of forests, which have forced upon my consideration the importance of having a National School of Forestry organized; and therefore to this aspect of the case I shall confine my subsequent remarks, simply premising that the interest which our country has in the improvement of the forest economy of Great Britain and Ireland, supplies equally cogent reasons for such a measure being adopted.

In illustration of the importance attached by practical men of science to the conservation of forests, I cite the opinion of Sir Joseph Hooker.

Dr. Hooker, the Director of the Royal Gardens at Kew, writing on this subject some years ago, remarked: " Forestry, a subject so utterly neglected in this country that we are forced to send all candidates for forest appointments in India to France or Germany for instruction both in theory and practice, holds on the Continent an honourable, and even a distinguished place, among the branches of a liberal education. In the estimation of an average Briton, forests are of infinitely less importance than the game they shelter, and it is not long since the wanton destruction of a fine young tree was considered a venial offence compared with the snaring of a pheasant or rabbit. Wherever the English rule extends, with the single exception of India, the same apathy, or at least inaction prevails. In South Africa, according to the Colonial botanists' report, millions of acres have been made desert, and more are being made desert annually, through the destruction of the indigenous forests; in Demerara the useful timber trees have all been removed from accessible regions, and no care or thought is given to planting others; from Trinidad we have the same story; in New Zealand there is not now a good Kauri pine to be found near the coast; and I believe that the annals of almost every English colony would repeat the tale of wilful, wanton waste and improvidence. On the other hand, in France, Prussia, Switzerland, Austria, and Russia, the forests and waste lands are the subjects of devoted attention on the part of the Government, and colleges, provided with a complete staff of accomplished professors, train youths of good birth and education to the duties of State foresters. Nor, in the case of France, is this law confined to the mother country; the Algerian forests are worked with scrupulous solicitude, and the collections of vegetable produce from the French Colonies of New Caledonia, etc., in the permanent museum at Paris, contain specimens which abound in evidence of their forest products being all diligently explored."

In the years 1860-64, during which years I held the office of Colonial botanist, and thus had my attention directed to this matter, the annual revenue derived from the whole of the Crown forests at the Cape of Good Hope was then only about £250 a year in excess of the expenditure on what was called *the conservation,* but included a wasteful sale of the produce; and thereafter the free revenue rapidly diminished, and the forests were rapidly disappearing. But latterly Count de Vasselot, an *élève* of the Forest School of Nancy, was appointed Commissioner of Forests in the Colony; and from a Colonial notice of an official report of his, it appears that these Crown forests, if regularly worked, would produce a yearly revenue of £235,000!

At the time referred to (1863-64) comparatively little was being done to obtain the greatest possible good from the Colonial forests of South Australia. In the interval the defence, exploitation, and extension of these forests has been entrusted to Mr. J. E. Brown as Conservator of Forests. For eight years past there has been expended on these works under his advice well-nigh £6000 a year; but this has been repaid within a small amount by revenue derived from the forests; while the value of the permanent improvements and extension of the forests is estimated at £100,000.

Again, from a statement in the *Indian Pioneer,* it appears that the Indian forest revenue for the last official year amounted to £1,040,000, and the charges to about £600,000, leaving a clear revenue of £440,000. In France the revenue and expenditure of the forest department were £1,405,104 and £641,508, according to a quotation by Dr. Brandis. But the French State forests cover less than 4000 square miles. Those of the Indian Government, including the second-class reserves, cover over 89,000 square miles, and a large proportion of the expenditure in India is occasioned by extensive plantations. In Prussia, from 10,000 square miles of State forests, there is derived a net gain of nearly a million sterling annually.

In addition to what I have alleged in regard to the importance of judicious conservation and scientific exploitation of forests, I may state that there are localities in which *forest extension* is the phase of forestry which is called for. Thus can drift sands be completely arrested and utilised; thus can the formation of mountain torrents be prevented, and thus to a corresponding measure can low-lying lands be secured against inundation. By a combination of forest conservation and forest extension with works of hydraulic engineering and irrigation, the wilderness and the solitary place can be made glad, and the desert made to rejoice and to blossom as the rose. All of these measures come within the sphere of operation of the forester; but for their direction and execution such education and training as is given in schools of forestry is required. The Government of the Cape Colony, when they resolved to improve the forestry of South Africa, had to obtain the services of Count de Vasselot, an *élève* of the School of Forestry in Nancy. The Colony of Victoria, and all Australasia, owes much to the Baron von Mueller. South Australia, when desirous of improving her forest and forest management, found a Scotsman, Mr. J. E. Brown, son of a father of widely-extended reputation in connection with forestry; but she had to go to America and fetch him thence. Arrangements have been proposed for the study of forestry being prosecuted at the College of Engineering at Cooper's Hill. But there are hundreds of young foresters, and sons of foresters, and sons of gardeners, who have been familiar with the treatment of trees from childhood, who cannot afford to go to that institution, and their services and inherited interest in trees is lost to the community.

From the organization of a School of Forestry national in its character I anticipate the happiest results. And though I see no immediate prospect of its being accomplished, I cannot doubt that sooner or later it will be. And at times I feel disposed, in anticipation of the event, to begin at once the shout—

"Ring out the old,
  Ring in the new;
Ring out the false,
  Ring in the true."

The proposal has received the approval of a Committee of the House of Commons, and the approval of the British Association for the Advancement of Science. And in Edinburgh a few of us are endeavouring, under the presidency of the Marquis of Lothian, to raise £10,000 for the permanent exhibition of many valuable objects which have been entrusted to us, and the establishment therewith of a Lectureship or Professorship of Forestry. Who will help?

THE TIMBER TREES OF CEYLON.

UNDER the title "*Timber Trees of Ceylon*, by Mudaliyar Mendis, with Notes on them by W. Ferguson, F.L.S.," a pamphlet of twenty-three pages has been issued from the *Ceylon Observer* press in Colombo. This little book is valuable as throwing some light not only on the botanical source of the trees, but on the character of the woods and the uses to which they are put in Ceylon.

The timber trees of Ceylon are interesting in consequence of the general hardness of their woods and the fine colour or figure of many of them; but notwithstanding this, Ceylon woods, with the exception of a few such as ebony and calamander, are scarcely known out of their own country. Many of the species, however, are common to various parts of India.

It is a fact that though most of the dependencies of the British Crown have at some time made a display of their timber resources by exhibiting large and striking slabs at some of the International Exhibitions, the exhibits of Ceylon have always been of a more diminutive character. An excellent collection of Ceylon woods, however, was shown at the International Exhibition at South Kensington in 1862. It consisted of about 160 specimens each about 21 inches long, 3 inches wide, and 1 inch thick. They were all well seasoned and polished; but though well selected, and many of them finely-figured pieces, they were too narrow to give a good general idea of what the woods would be like in bulk. And here we may perhaps say a few words upon selecting and preparing woods for exhibition purposes. Dead wood should in all cases be rejected, and a fair average sample taken from properly-felled timber: the section should be cut in the case of large slabs through the centre of the tree, so as to show the sapwood as well as the heart-wood, so that the proportion of each may be seen at a glance; the bark should also be left on the edges. For small and handy specimens where a large collection is got together, no size can be better than that adopted by the Indian Forest Department in the fine set of woods sent by them to the Paris Exhibition in 1878, a duplicate set of which is now in the Kew Museum. These measure 9 inches high by 6 inches wide and 2 inches thick: they lend themselves wonderfully well for any kind of arrangement. On a staging, for instance, they can be placed one above another without loss of space; and in the glazed cases of a museum, they suit almost any shelf; moreover, they are convenient for handling for examination. With regard to numbering, woods should always be *stamped* on the backs, and never on their faces. It often takes a considerable amount of planing to remove them.

But to return to the Ceylon woods. In noticing the little work which has given rise to these remarks, a fitting opportunity seems also to occur to bring to more general notice some few of the most striking or important out of the ninety-six different kinds mentioned in the book.

Taking them in the order in which they occur, and without any scientific classification, we find the following :—

Cassia Siamea, Lumk, the Araucaria of the Singalese.—This is not only a useful timber tree, but it is valuable as an ornamental avenue tree. It is well known also in India. The wood rarely exceeds a foot in diameter; it varies in colour from dark brown with darker streaks to nearly ebony black. It is used for ornamental work, and makes extremely pretty walking-sticks. In exposed situations, it is said to be liable to contract and expand with the weather. It is said to be an excellent wood for fuel, for which purpose it is largely used on the railways in Ceylon.

Chloroxylon Swietenia De Buruta, or Satinwood, one of the best known and most abundant of the useful timber and fancy woods of Ceylon. It is found chiefly in the North-Western and Eastern Provinces, especially at Trincomalee and Batticaloa, where very large logs of it can be procured, but owing to its weight and the small size of the vessels employed in the coasting trade, the large-sized logs have to be cut up to secure their easy transport. The flowered or figured satin, which is the wood most valued for cabinet work, is of course rare compared with the plain wood. Both kinds are used for doors, window frames, and all parts of house-building as well as for furniture. The wood is hard, heavy, and somewhat difficult to work, and the beautiful light yellow or straw colour of the freshly-cut wood turns darker on exposure.

Diospyros quæsita, Thw. Kalu-mædiriya, or Calamander wood.—The following note is given on this beautiful wood: "I recollect reading in 1849 a very interesting account by Mendis Mudaliyar of the mode of procuring Calamander wood, and the fact that the variegated part so much in request is an accidental product of the tree. Some trees produce none of it, some near the lower part of the trunk; whilst in others it is found only near the middle of the tree, and generally not in luxuriant trees growing in rich soil, but in those growing in dry rocky ground. These remarks apply to several of the trees producing variegated or ornamental woods, such as the tamarind, in which the beautiful calamander-like wood is found only in very old trees, and generally in the heart of the lower part of the trunk, or in the roots."

Carallia integerrima, De Dawata.—This is one of the most common and remarkable in the cinnamon gardens near Colombo, and up to 3000 feet elevation. Several of these are remarkable for the large masses of aerial roots like deer's horns which are sent out from various parts of the trunk, thus proving that though often growing in very dry situations, they are closely allied to the mangroves, to which family they belong. The trees when isolated have wide-spreading heads, and are densely covered with dark-green foliage, and are consequently one of the favourite shade-trees in the various cinnamon gardens on the west coast of Ceylon, in the pure white sand of which they flourish, as well as in the richer soil of the central province. It is indigenous in Southern India, Bengal, Burma, China, and tropical Australia. The wood is of a reddish colour, very ornamental, being prettily marked with lighter wavy lines; it is tough, but is said not to be durable. It is, however, much used for furniture, fittings, etc., and in Burma for rice pounders and planks, while in Calcutta it is used for house-building. This wood is of such a distinct character in its lightish-coloured wavy lines, that it would no doubt prove an acquisition to the cabinet woods already in use in this country were it imported. I am not aware that it has been introduced even for experimental purposes.

Berrya Ammonilla, Roxb. Hal-Milila.—The tree is considered, next to that of the Jack, as the most valuable timber tree in Ceylon. Large quantities of it are exported from Batticaloa and Trincomalee to other parts of the island and to Madras, at which place it is known as Trincomalee wood. The famous Masula boats are built of the wood, which is of a light red colour fading to brown, highly esteemed for its lightness and strength; it is straight-grained, slightly pliable, but tough. It is used by coachmakers, coopers, and builders generally, and is applicable for almost any purpose. The tree is a tall one, with an erect, straight trunk, often with a clear stem of from 50 to 70 feet without branching. It is described as a tree of easy culture, and one that should be much more grown than it is.

Chickrassia tabularis, A. Juss; Hulanhik or Chittagong wood.—A tall tree, often 60 to 80 feet before branching, growing in Ceylon, Southern India, Eastern Bengal, Assam, and Burma. The wood is close-grained, of a light-brown colour, prettily marked with irregular veins of darker brown, the whole having a satiny lustre. It is much used for furniture in India, and is said to be very durable, having been used in a palace of one of the Kandyan kings, where it lasted some hundreds of years. A very fine specimen of this beautiful wood is shown in the fine collection of Indian timbers in Museum No. 3 of the Royal Gardens, Kew.

Mesua ferrea, L. Na-Golra, or Nagesar.—A large evergreen tree of Ceylon, where it is usually planted for its ornamental character in the neighbourhood of Buddhist temples, and found also in Eastern Bengal, Assam, South India, Burma, and the Andamans. The wood is extremely hard, of a rich dark-red colour. It is used for building purposes for bridges, piles, etc., and is said to be very durable under water; it is also an excellent wood for sleepers. The wood would be more generally used were it not for its extreme hardness and difficulty in working it.

Albizzia Lebbek, Benth; Sûriya mără, or Siris tree.—This is a large deciduous tree, native of tropical Himalaya to 5000 feet, Khasia, India proper and Ceylon to Burma, and Tenasserim, Malay Islands, China, N. Australia, and tropical Africa. The heart-wood is hard, of a dark-brown colour, mottled, with deeper coloured longitudinal streaks; it is durable, seasons, and works well, and takes a good polish, and is used for furniture, picture frames, building purposes, as house posts, etc., also for the naves of wheels, pestles, mortars, sugar-cane crushers, boats, etc., besides which it makes a very good charcoal.

The few woods here indicated recommend themselves to notice on account of their fine colour or figure. From specimens of all of them contained in the Kew Museum, they would appear to be well worthy of a more extended application. They are referred to here as only a few instances of the general character of Cingalese woods which require to be more known to be appreciated.

HISTORICAL NOTICE OF SOME CELEBRATED TREES.

BY THE LATE PROFESSOR WALKER ARNOTT, LL.D.

PART VI.—THE LIME.

THUS it will appear from these notices that although the Coniferæ, to which the pine, yew, and cedar belong, be usually denominated soft woods, they contain not only the hardest but most imperishable timber known, but also trees of the greatest bulk and greatest age on the face of this earth, with the exception, perhaps, of the baobab and of the slow-growing

> "Lord of the woods, the long surviving oak."

After these rank the lime, and it is worthy of remark that both the baobab and the lime, like most of the Coniferæ, afford wood of a soft quality.

In taking measures of different trees, much error arises from one taking the girth near the root, another 3, 4, or 5 feet from the ground, and a third at the springing of the branches. The truth is, no particular height ought to be adopted, and a different mode of measurement ought to be followed if we intend future naturalists to draw deductions from our observations. Close to the root the trunk swells out considerably, and it does the same where the branches originate; between these points the outline of the trunk forms a curve, and the proper place for measuring its circumference is where that circumference is smallest. This ought to be applied to all trees except the pine.

The subject is of great interest, not only in an agricultural and commercial point of view, but in a physiological, as it has led De Candolle to propound the theory that trees in their native soil, and not subject to external injuries, would survive as long as the world itself.

Before concluding, I cannot refrain from drawing your attention to the *Dracæne draco*, or dragon tree. I mentioned that the age of certain, but not of all plants, could be ascertained by means of the annual layers, and that the palms showed no layers. Now, although the *Dracæne* is not a palm, it belongs equally with them to the great class of monocotyledonous plants, in which the deposit of woody matter is made in quite a different way from what we observe in the oaks, limes, cypresses, and others we have enumerated, all of which belong to the dicotyledonous tribe of vegetables. Now among those which have no annual rings the *Dracæne* stands pre-eminent, and of these the famous dragon tree of the city of Orotava, in Teneriffe, furnishes a case of longevity perhaps transcending that of the oldest baobabs, or of the Mexican cypresses. This tree has been visited by many competent observers, and among others by that prince of scientific travellers, the veteran Humboldt, who has given a good figure of it as it appeared about 70 years ago, from a drawing made by M. Ozonne in 1776. A later and much fuller account was published in 1827 by M. Berthelot, and a fine figure of the mutilated trunk, as it appeared after the terrible storm of the 21st July 1819, forms one of the most striking pictorial illustrations of Webb and Berthelot's *Histoire Naturelle des Iles Canaries.*

The trunk is by no means equal in size to some of the dicotyledonous trees I have noticed. It is only 50 feet in girth at the base, and not more than 60 or 70 in height. But, at the discovery of Teneriffe in 1402, over 4½ centuries ago, this dragon tree was nearly as large as at the present time, and had been immemorially an object of veneration among the natives. After the conquest, at the close of the fifteenth century, the trunk was employed as a boundary in dividing the lands, and as such is mentioned in ancient documents. It had changed very little since that period, until the summer of 1819, when a third of its spreading top was carried away by a tempest. But it still continues to vegetate, and its remaining branches are annually crowned, as they have been each returning autumn, perhaps for several thousands of years, with its beautiful clusters of white, lily-like blossoms—emblems of "the eternal youth of nature." In regard to its real age, however, the usual means of investigation are defective, on account of the want of annual layers or rings; and apart from historic evidence, we can only form a somewhat conjectural estimate, by a comparison with young trees of the same species. M. Berthelot, who assiduously devoted many years to the study of the civil and natural history of the Canary Islands, and who has therefore attempted the comparison under the most favourable circumstances, declares that the calculations he has made, upon the supposition that the trunk has increased in size even at the rate of young dragon trees up to within the last 800 or 1000 years, have more than once confounded HIS imagination. We cannot therefore but assign the very highest antiquity to such a tree, which the storms and casualties of four centuries have scarcely changed, and conclude that in the vegetable kingdom there are many living antiquities, compared with which the celebrated pyramids of Egypt are but the mushrooms of a single day's duration.

THE INDIAN FOREST SURVEY.

By MAJOR F. BAILEY, Royal Engineer, F.R.G.S., Superintendent of Forest Surveys in India. Read to the Geographical Section, British Association, at Aberdeen, 11th September 1885.

IN his paper on the "Progress of Forestry in India," printed in the *Transactions of the Scottish Arboricultural Society* for 1884, Mr. Brandis, formerly Inspector-General of Forests to the Government of India, writes as follows :—"The long period of peace, of good and just government which followed the consolidation of the British Indian Empire, the construction of railways and other public works, and the rapid increase of trade and prosperity, have contributed much to accelerate the destruction of the forests of India. Over large districts and entire provinces the forests have been cleared away to make way for the plough and the increasing population, and when forests were left, most of the accessible timber was cut and brought away to be used as fuel and charcoal, for shipbuilding, for railway sleepers, for bridges and other buildings. Hence it came to pass that forests, which in olden days were regarded as a thing to be got rid of and as an obstacle to civilization, attracted attention, and that the necessity for preserving them began to be considered."

One of the first things to be done was to select and demarcate the principal forest tracts, so as to put a stop to further encroachments caused by the spread of cultivation, to free the demarcated area as far as possible from the rights which villagers and other persons possessed in them, and to frame a clear record of all rights which could not be so got rid of. The most important of the rights here referred to are the cutting of trees, tapping for resin, the collection of dead leaves from the ground, burning the grass, and the grazing of cattle, sheep, and goats. All of these, and many other such practices, are manifestly extremely hurtful to the forest, and unless they can be made to cease altogether, or at any rate unless they can be controlled and limited, forest conservation becomes impossible. But such rights are very difficult to deal with, for while on the one hand it is in the interest of the country at large that extensive and well-distributed areas should be permanently maintained under forest for the supply of timber and other produce to the population, the curtailment of them is frequently a matter of real hardship to the individuals who possess them. The fact that the continued exercise of injurious rights will ultimately destroy the forest, and thus render their further enjoyment impossible, is not recognised, and if this could be proved to the minds of the right-holders they would not be much affected by it, as they are, generally speaking, satisfied if there is enough to provide for their own personal requirements without considering those of their descendants.

Although the Forest Act did not appear until 1878, the process of demarcation has been proceeding for the last thirty years, and the areas reserved on the 1st April 1883 were as follows:—

Bengal Presidency, . .	35,667	square miles.
Madras, ...	2,782	„
Bombay, ...	9,823	„
Total, .	48,272	„

or about 5½ per cent. of the total area of British India, not including the Native States. The forests now consist of the principal areas to which cultivation had not extended at the time that the Forest

Department commenced its operations, and the chief of them had been saved from destruction either because, in the absence of communications, they were inaccessible, or because they occupied ground which is too much broken to be suited for farming purposes, or which cannot be irrigated. The principal forests consist of extensive tracts of wild, almost uninhabited country, situated either in the plains or on the low ranges of hills rising from them, or on the lower and middle slopes of the Himalayas up to an elevation of 8000 or 9000 feet above sea-level. The want of protective measures in former years has resulted in the most serious deterioration of the forests which have now been reserved, and they, in many instances, include within their boundaries considerable areas which are partially or entirely denuded of trees, or from which the valuable species have disappeared. The ground, especially on the great hill ranges, is still, however, generally speaking, more or less densely covered with trees and jungle, and in the mountains many of the slopes and ridges are covered with a dense growth extending over large areas. The gradual deterioration and ultimate extinction of forests has gone on in all countries, and is still unfortunately in progress; but the necessity for preserving those which remain, and for reclothing denuded mountain ranges, is now recognised in most civilised countries. In France very large sums have been expended annually for the last twenty years in afforesting the slopes of the Alps, the denudation of which has resulted in the most disastrous floods, and Colonel Playfair told us yesterday that the most stringent measures are being taken by the French in Tunis to arrest the process of destruction of the forests of that country before it has gone too far.

In Burma and in Southern and Central India, the principal trees are the teak and sandalwood; in the north-eastern portion of the peninsula the *sál* and the india-rubber tree are the most valuable species, while in the north-west the principal forests are stocked with *sál*, sissoo, and the cutch tree. These kinds are, however, largely mixed with others, many of which are at the present time almost without value, and with bamboos. In the North-Western Himalayas the most valuable tree is the deodar, which is found mixed with several species of pines, firs, and maples, and also with elm, hornbeam, birch, and poplar.

Until the Forest Department undertook the management of these areas a few years ago, they were not thought to have any great value; it was supposed that they would supply the wants of the population in forest produce and grazing for ever, without the necessity for any special measures of protection, and nothing in the way of an accurate map of them was required. The system of management adopted by the Forest Department comprises not only protection against the illicit felling of trees and removal of produce, but also works of regeneration, such as planting and sowing, the making of export roads, inspection paths and timber slides, the cutting of climbers, protection against fire, and the subdivision of the forest into blocks and compartments with a view to arranging methodical plans of working. The damage done by fires in the Indian forests is enormous, and to control those which may break out, either within the boundary or on adjoining properties, a system of cleared lines is carried round and through the most valuable portions of forest, so that any block which becomes ignited may be isolated from the rest of the area. To enable a rational plan of working to be drawn up, so that the forest is secured against gradual extinction by the removal of more wood than can be replaced by the annual growth of the trees and by planting or sowing to replace those which are cut down, an enumeration of the trees, either over the whole forest or over representative areas of it, must be made. Such a "working-plan," or scheme of management, is essential for all forests. Trees cannot be dealt with like a crop of annuals which is sown and reaped in a single year; the age at which the most valuable timber trees are most profitably cut extends over several generations of men, and unless the principles of management are such as will conduce to the desired end, and unless continuity of aim and action can be maintained, failure is certain to follow. In order to guide and regulate the work of all kinds to be done in the forest, and to form the basis for a budget estimate, an annual plan of operations must be drawn out in which the work to be done in various localities is specified and the lengths or areas are stated. The record of the rights of private persons or village communities within the forest must specify the parts of it in which each right can be exercised, while the roads or paths that may be used to lead cattle to certain springs of water, and the like information, must be clearly laid down. The boundaries and positions of all boundary marks must be recorded, so that further encroachments on the forest may be rendered impossible. Lastly, a careful record of all operations and of their results must be kept for future guidance. All this manifestly necessitates the provision of maps capable of showing a considerable amount of detail.

The Imperial Survey Department undertakes the preparation of maps on scales varying from 2 in. to 16 in. = 1 mile of lands which are assessed and which pay revenue, the rest of the country being surveyed by the Topographical Branch on the scale of 1 in. = 1 mile. Waste lands, or forests of comparatively small extent, lying enclosed within the assessed lands, are usually represented in the maps of the Revenue Survey Branch; but such lands are unassessed, either because they consist of broken ground, or because they are covered with dense jungle, or because they cannot be irrigated, and the accurate survey of such ground being both difficult and expensive, the preparation of fully detailed maps of them was not, a few years ago, considered to be warranted by the use that could be made of them for revenue purposes; hence it follows that when such tracts were shown in the revenue maps, they were usually surveyed in less detail than the cultivated and revenue-paying country. But the most extensive and valuable forest tracts are situated within the area dealt with by the Topographical Branch, and thus it follows that maps of them on a larger scale than 1 in. = 1 mile cannot be looked for from the Imperial Survey Department.

In the early days of forest management, maps on small scales and without much detail sufficed; but it is obvious that, to fulfil the numerous requirements which a more rational system involved, detailed maps on a large scale became an absolute necessity, and in 1872 measures were taken to provide them. It would have been inconvenient to the Surveyor-General's Department to be called upon to undertake the survey on an unusual scale of numerous comparatively small areas scattered throughout the country, while it was recognised that the maps were destined to meet special departmental requirements, and that there would be many advantages if their preparation were entrusted to a special branch of the Forest Department working under the control of the Surveyor-General. This arrangement was therefore ordered, and it has since worked most satisfactorily; the Superintendent of Forest Surveys has largely profited by the relationship in which he has been placed to the Surveyor-General, and at the same time the Government has secured a guarantee as to the quality of the work executed by him.

The scale on which the forest maps should be drawn formed the subject of much discussion, and in 1874 the officer who had been appointed Superintendent of Forest Surveys, happening to be on leave in England, was deputed by the Secretary of State to visit the Forest Survey Offices in France, Saxony, Bavaria, and Baden, in order to study the system adopted in the preparation of forest maps in those countries. On the one hand, it was essential that when the ground was gone over, the survey should be made on a sufficiently large scale to answer the special requirements on account of which it was undertaken, and that it should be executed on such a system and with such a degree of accuracy as would admit of its being made the basis of any further work that might subsequently be required; while on the other hand, as the cost of a survey increases at a high rate with an increase in the scale, it was necessary to adopt the smallest scale that could be made to answer the purpose. Ultimately it was decided that for the more valuable forests the scale should usually be 4 in. = 1 mile, while for those of less importance half the scale would suffice; and this has generally speaking been found suitable, though larger scales have occasionally been adopted for small areas of exceptional value.

The scale determined, the superintendent had to raise and organize an establishment of surveyors and labourers, and he was fortunate enough at the outset to secure the services of Mr. W. H. Reynolds, an Assistant Conservator of Forests in the Punjab, who had been for some years in the Imperial Survey Department, and also of three European surveyors, who had likewise been employed in the same Department. Aided by these gentlemen, and acting under the advice at all times so readily afforded him by the Surveyor-General (General Walker), he raised and trained a party of native surveyors, with whom he commenced to carry out the work before him. The first survey undertaken was that of the forests of Dehra Dun, in the North-Western Provinces. These forests, which cover an area of 573 square miles, are much interlaced with private lands, and as no good map of the latter then existed, it was thought desirable to construct a complete map of the entire district, the forests being surveyed by the new department, and the private lands by a party of the Imperial Survey. This joint work was not finally completed until 1876; but in 1875, when it was drawing to a close, the survey of the forests of Kumaun and Garhwal, also situated in the North-Western Provinces, and embracing an area of some 1400 square miles, was commenced, and this has lately been completed. The survey of about 1600 square miles of forest and private land in the Haiderabad Assigned Districts was commenced in 1881, and is now in progress. Altogether, since 1872, an area of about 3000 square miles has been surveyed and mapped, nearly the whole of it on the scale of 4 inches = 1 mile.

Manifestly it will take a considerable number of years to work over the whole area, about 36,000 square miles, of reserve forests in the Bengal Presidency; but the preparation of detailed maps of the whole of these forests is fortunately not a matter of urgency at the present time, since for those which are in a backward condition, and in which nothing but simple protection can be undertaken for some years to come, any small-scale map with the boundaries marked on it, or a sketch-map, can be made to suffice for present necessities. A great deal of work has been accomplished by the Forest Survey Department in the way of laying down boundaries on existing maps, and such maps have been found extremely useful, for it is very important that something of the sort should be placed as soon as possible in the hands of the officers who are charged with the management of the forests.

When the survey party takes the field at the beginning of the cold season, the officer in charge finds himself in command of a small army of 25 to 30 surveyors, European and native, and perhaps 150 to 200 chainmen, flagmen, and others, for whose accommodation tents, clothes, food, and cooking apparatus have to be carried; then there are the instruments and tools required for the work, so that the amount of baggage is very considerable. To carry all this he has to hire camels or bullock-carts, and the whole party then marches by stages of from twelve to fifteen miles a day from its headquarters to the scene of the work, where the men are at once distributed over the ground. Each native surveyor is provided with the requisite number of chainmen and flagmen, as well as with the needful instruments and tools, and a definite piece of work is assigned to him. Four or five native surveyors are placed under the orders of one European surveyor, who is held responsible to the superintendent for the work done by them; it is his business to visit them constantly and check their work, himself giving the finishing touches to it, and he has a piece of independent work of his own in hand at the same time on which to occupy himself when he finds the opportunity. A camp computing office is established in some central position, and such computations as are needed at once are worked out as the field-books are sent in. The survey thus proceeds in the field for some six or eight months, and when, with the increasing heat, the forests begin to become unhealthy, or when sufficient work of this kind has been accomplished, the party moves back to headquarters. Chainmen and flagmen are then discharged, or placed on half-pay, and the rest of the establishment is employed either in drawing maps or in computing the triangulation for the next session's work.

Considerable skill and experience are needed for the efficient control of such work, which if not properly supervised and arranged, is sure to show this in inferior quality, insufficient quality or high rates. No hard-and-fast rules can be laid down for the execution of surveys; the officer in charge must vary the procedure according to circumstances, with reference to the nature of the ground and the requirements of each particular case in the way of amount and accuracy of detail. It is of course quite possible to produce accurate detailed maps of the most unpromising country if time and money are of no importance; but as this is not usually the case, it has to be carefully considered how a map that will answer the required purpose can be produced in the shortest possible time and at the smallest possible cost, and all expensive processes, which are out of proportion to the rest of the work, must be studiously avoided.

The ground worked over by the Forest Survey Department often presents exceptional difficulties, of which some of the principal are the following. The ground is frequently very much broken and intricate; the crop of trees, fortunately for the country if not so from the surveyor's point of view, is often very dense, and where this is not the case there is frequently a thick growth of bamboos or tall grass on the ground; it is very generally the case that good drinking water is obtainable only in certain places at long distances apart; the forests are often infested with dangerous wild animals; and as a rule there is considerable difficulty in obtaining supplies of food and great liability to attacks of jungle fever. The want of good water is frequently a cause of serious delay in the execution of the work, and, as the principal item of expenditure is formed by the wages of the men employed, it follows that slow progress means a high rate per acre. The surveyors must camp in the neighbourhood of a spring of good water, and if it is not near their work, they lose a great portion of each day in going out to and returning from the part of the forest in which they are employed—men climbing hills all day in a heavy jungle with a hot sun overhead are apt to drink a great deal of water, and if it be of bad quality they are liable to be attacked by jungle fever or dysentery, and, in spite of all precautions that are taken to avoid it, a considerable number of the men are annually laid up with fever towards the end of the field season when the hot weather is coming on.

The wild animals which inhabit the Indian forest afford excellent sport for those who have the time to engage in it, which the surveyors have not, for the out-turn of good work of this sort is in direct proportion to the time spent on it, and arrears of surveying and mapping cannot be brought up by a stroke of genius; but to the unarmed native surveyor the presence of dangerous wild beasts in the forest in which he is called upon to work affords no attraction, and cases have occurred in which they have caused the most serious inconvenience. On one occasion a native surveyor, having seen a wild elephant, decamped and could not be persuaded to re-enter that part of the forest, while his accounts of the terrors of the locality spread among the other men, and for a long time the ground could not be surveyed. On another occasion three native surveyors having seen a tiger, climbed a rock and remained there all night. In the morning they managed to convey an appeal to the officer in charge to come to their relief, which he did, but without seeing anything of the tiger. This place was also in disfavour for some time afterwards. But a much worse case was that of the Jarhwal man-eater; this tiger had killed a very large number, some 300 or 400 it was said, of woodcutters within the area which had to be surveyed. The superintendent was aware that if he lost one of his men he would probably be obliged to abandon the work, and he took all means in his power to accomplish its destruction; but although the trail was twice followed, and the bodies of men who had been carried off were discovered, the tiger was not bagged. At last, as none of the survey party were touched, an idea gained ground among the men that the tiger bore them no ill-will, and they considered themselves perfectly safe if they could satisfy him of their identity, which they were content to do by carrying aloft in a cleft bamboo an old envelope from the superintendent's wastepaper basket!

The natives present a strange mixture of bravery and cowardice; they do not hesitate to express fear when they feel it, and do not seem to think that to be afraid is anything to be ashamed of, but at the same time they frequently perform acts that appear recklessly brave. An old man of seventy, armed with a tulwar, has been seen hunting about in the tall grass for a wounded tiger which was lying concealed close by him, and he had ultimately to be forced into a position of safety on the back of an elephant. On another occasion a bear had taken up his quarters in a dense part of the forest, and had killed several bamboo-cutters who had unwittingly invaded his retreat; a man who had just been mauled by him insisted in joining a passing Englishman who went in search of the bear, and could not be persuaded to keep behind the rifle, but advanced boldly into the beast's lair, anxious to take a leading part in the retribution which shortly overtook him. The servant of a noted sportsman in the North-Western Provinces once proposed to his master that he should walk past a dense piece of cover in which a wounded tiger was lying, in order that the animal might be induced to spring out into the open and thus afford a good shot!

Much may be done with such men, not only in the defence of our frontiers from foreign aggression, but also in more peaceable work such as that which is now treated of. The experience of the natives of India gained in the Forest Survey Department, has been that, with skilful training and under judicious management, almost anything may be done with them. From the very beginning they were taught that accuracy was of far more importance than rapidity of work or anything else; if a native surveyor thinks that his officer is not very particular, and would not be sorry to show a large out-turn of work even at the sacrifice of something in the way of accuracy, he can develop the most astonishing powers of "fudging."

To make certain that nothing of this sort should become the practice of the Forest Survey Department, a good deal of time was at first *spent*, not *wasted*, in encouraging the men to bring to notice discrepancies which occurred in their work, and in making them go over it again in order to bring it perfectly right, the officers being most careful never to be angry or impatient with them on account of any errors brought to notice in this manner. Thus a solid foundation for the execution of correct work was laid, and if progress was at first slow and the cost of the survey was proportionately high, the men soon became more skilful, and the instances in which the ground had to be gone over a second time became fewer. In the beginning only the more simple parts of the work were assigned to the native surveyors, and their drawings, which were not always very neatly executed, were incorporated in the field-sheet prepared by the European surveyor; but some of the best of them were not satisfied to execute work of this class only, and they qualified themselves by degrees to complete their field-sheets almost entirely with their own hands, while a few of them can now sketch in the eye-contours with great accuracy, neatness, and artistic taste, always, as has been explained, under the careful and constant supervision of a European surveyor. The combination of Native and European labour in the Forest Survey Department has worked extremely well.

Detailed surveys of wild and densely-wooded country have rarely been made before in India, and in spite of the large proportion of the work which is done by cheap native agency and the adoption of special methods of procedure to suit the exceptional nature of the undertaking, it is evident that such surveys as those described are likely to be more expensive than similar work in open, cultivated country. An additional cause for a comparatively high rate lies in the fact that the forest not infrequently consists of detached blocks, and this necessitates much moving about during the progress of the work. But the revenue derived from the Indian forests has largely expanded during the last few years, while the condition of the forests themselves has been greatly improved and their capital value enormously increased.

Good maps facilitate systematic and economical management, and enable work to be carried out and recorded in a manner which would be impossible without them ; and to provide such maps, even at a somewhat high rate as compared with the cost of other maps on the same scale, is a necessity and a distinct economy.

UNITED STATES CENSUS FORESTRY REPORT.

BY SAMUEL L. BOARDMAN,

State Agent for Maine to the U.S. Department of Agriculture.

IN your July number you are pleased to speak in terms of high appreciation of the Forestry Report of the United States Department of Agriculture, and the work which our Government is doing through this Department in aid of forest economy. With your permission I wish to give your readers an idea of what has been further accomplished in this direction by our Government, through the agency of the Census Bureau of the Department of the Interior.

When the force of special experts was arranged to take charge of the work of our Tenth Decennial Census, in 1880, the forestry work was assigned to Professor Charles T. Sargent, Professor of Arboriculture in Harvard University, Cambridge, Massachusetts, and director of the Arnold Arboretum; than whom a more competent gentleman for such service could not be found in our country. From time to time between 1881 and 1883 the Census Bureau issued special bulletins conveying summaries of information upon subjects of immediate interest to the public. The forestry division issued twenty-four such bulletins, many of them accompanied by coloured maps, showing the distribution of certain species of trees in different States, and also bearing statistics on the lumber industry, fuel value of different woods, specific gravity of different woods, amount of tannin in the bark of certain trees, and the consumption of forest products as fuel in the United States during the census year of 1879. These bulletins kept the public informed of the work of the Forestry Bureau as it progressed, until the publication of the final report.

The final report on the forests of North America (exclusive of Mexico), although dated 1884, was not issued from the Census Bureau till near midsummer of 1885. It is comprised in a large quarto volume of x., 612 pages, divided into eleven parts. The general introduction to Part 1 is devoted to a discussion and description of the natural forestry divisions of the United States, six in number, as follows:—1, The Northern Forests; 2, the Northern Pine Belt; 3, the Southern Maritime Pine Belt; 4, the Deciduous Forest of the Mississippi Basin and the Atlantic Plain; 5, the Semi-tropical Forest of Florida; and 6, the Mexican Forest of Southern Texas. Interesting facts pertaining to soil, rainfall, and temperature are given in this introduction, with lists of the generic and specific distributions. Part 1 follows, comprising 200 pages, and embraces a catalogue of North American forest trees, with remarks upon their synonymy, bibliographical history, distribution, economic value and uses. A feature of high value to this catalogue is the bibliographical references to the history of the species; and in many instances no less than seventy-five references are given to authorities wherein the species is described, together with citations to volumes in which figures and illustrations of the same occur. Four hundred and twelve species are described, and an index to this first part comprises twenty-four double-column pages in fine type.

Part 2 comprises the results of a critical examination of the woods of the United States, to determine (1) the fuel value of the woods; and (2) their value as material for construction. This portion of the volume extends to about 150 pages; and very elaborate tables are given as follows:—I. Specific gravity, ash, and weight per cubic foot of dry specimens of four hundred and twelve species of wood. The thorough character of the work embodied in this table may be gathered from the following items of examination: (*a*) State from whence the specimen was obtained; (*b*) locality in the State where obtained; (*c*) name of person collecting the specimen; (*d*) character of soil on which it grew; (*e*) diameter of tree in meters; (*f*) layers of growth of heart wood and sap wood; (*g*) specific gravity determinations (three examinations each, and an average); (*h*) ash determinations (two examinations and an average); (*i*) weight per cubic foot in pounds; (*k*) remarks. II. Actual fuel value of some of the more important woods of the United States; embracing botanic and common name of species; place whence obtained; fuel value per cubic decimeter and per kilogram; relative fuel value by volume and weight; percentages in the dry wood of ash, hydrogen, carbon, oxygen, hydrogen combined with oxygen, excess of hydrogen; specific gravity, and weight of cubic foot in pounds. III. Behaviour of the principal woods of the United States under transverse strain—comprehending name of species; state and locality whence obtained; name of collector; character of soil in which specimen grew; specific gravity of the air-dried specimen; a neat diagram showing direction of grain for each specimen; coefficient of elasticity in the first and second defections; defection in millimeters, under a pressure in kilograms, of 50, 100, 150, 200; 0 (set); 200, 250, 300, 350, 400, 450, 500, 550; ultimate strength (transverse pressure); remarks. This table embraces an examination of four hundred and five species. IV. Behaviour of some of the woods of the United States under transverse strain, specimens eight centimeters square. This table embraces examinations of twenty-two species, the points involved being similar to those in Table III., with the addition of results of co-efficient of elasticity, direction of pressure to grain of wood, modulus of rupture, and ultimate strength. V. Behaviour of the principal woods of the United States under compression; embracing species, whence obtained, soil, longitudinal compresssion and ultimate strength in kilos, and pressure in kilograms, required to produce an indentation in millimeters of 0·25, 0·51, 0·76, 1·02, 1·27, 1·52, 1·78, 2·03, 2·28, 2·54, 4·81, 5·08. The specimens of woods used in the above-named series of experiments are deposited in the National Museum at Washington, D.C., U.S.A., and in the museum of the arboretum of Harvard University, Cambridge, Massachusetts, U.S.A. The surplus material has been worked up into 12,961 museum specimens of good size, showing as far as possible the bark, sap, and heart-wood of each species, made up into sixty sets, and distributed among the educational institutions of the United States and Europe. One of these sets goes to the Museum of Science and Art, Edinburgh, Scotland; one to Rome, Italy; one to Lisbon, Portugal; one to Paris, France; one to Montreal, Canada; one to Sydney, New South Wales; one to St. Petersburg, Russia; one to Königsberg, Germany, and the remainder to local museums in different American States.

Part 3 is devoted to the forests of the United States in their economic aspects, comprehending a study of the forestry statistics; the lumber industry; the character of the fuel used in the different sections of the country; consumption of charcoal; consumption of tannin; losses by forest fires; and a particular description of the forests of each of the six grand forestry divisions into which the United States have been divided, each State being described by itself, with an account of the forest flora peculiar to each. The general index to the volume comprises thirty-one double-column pages of fine type.

The maps in this volume are an interesting and noticeable feature. There are in all thirty-nine maps. They are of two sizes: one $7\frac{1}{4}$ by $9\frac{1}{4}$ inches, and one $9\frac{1}{2}$ by 15 inches, all printed in colours, and different shadings. These maps show (1) the character of the fuel used in the different sections of the settled portion of the country; (2) the proportion of woodland within the settled area burned over during the year 1879; (3) showing the density of forest growth in each of the States; and (4) the distribution of the different species in the various States. As indicating the mechanical character of the work in these maps, I may say that the engrav-

Fig. 1

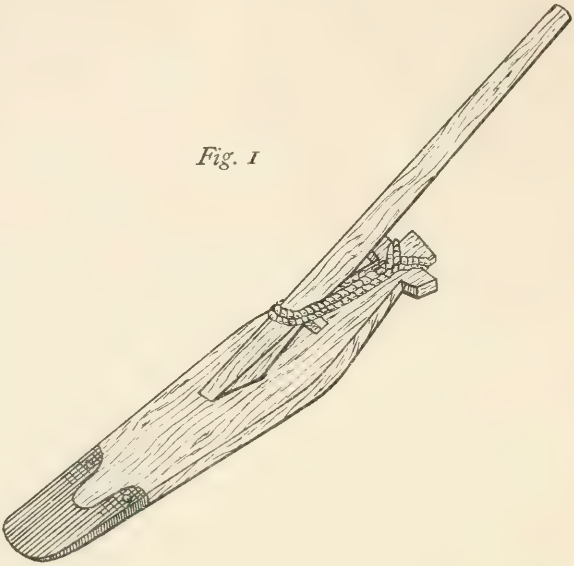
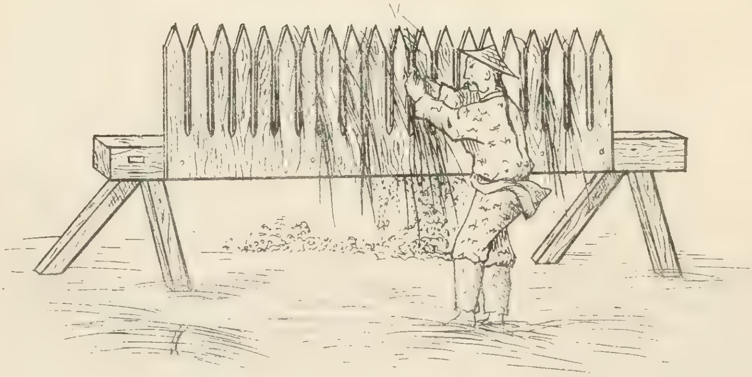


Fig. 2



ing is fine, the shading and line work as delicate as that on a bank note, and the colouring such as to convey facts rapidly. For instance, there are a series of eighteen maps showing the density of forest growth in the several States, and different shadings (light or dark, the colour being a definite shade of green) show where the first growth is less than one cord per acre; from one to two cords; from two to five cords; from five to ten cords; from ten to twenty cords; from twenty to fifty cords, and above fifty cords per acre. Different colours on the maps show the distribution of different species, and where wood has been cut off.

The chief graphic feature of this report, however, is a portfolio of sixteen maps, accompanying the report. These maps are all of a size of engraved surface, of 17¾ by 22½ inches. The work is fine both in engraving and colouring. These maps show (1) the portion of the forest, prairie, and treeless regions of North America, exclusive of Mexico; (2) the natural divisions of the North American forests; (3) the distribution of the different genera; and (4) the relative average density of existing forests. These maps are an interesting study, and the entire work is a splendid example of American scholarship, expert scientific investigation, and the liberality of our Government in the encouragement of the science of economic forestry.

AUGUSTA, MAINE, U.S.A.

FROM PROUD PRESTON TO POOR JAPAN.

BY HENRY F. MOORE, FROME.

THIS is a long journey, but it was one that was made in imagination by the writer but a few weeks ago. Coming home from the great agricultural show of the year, one of the first things found waiting was a volume of reports sent in by American consuls on the agricultural machinery of their several districts. Among these was an illustrated report on the implements and machinery in use in Japan. These were in such a marked contrast to the exquisite and complete English machinery, that it was felt that there must be a very large number of persons who would like to have a glance at a few of them. The first class of implements described are those for breaking up the ground, and consists of spades (convertible into mattocks) and ploughs. In Fig. 1 we have the spade—a long clumsy arrangement, that can be converted into a mattock (a kind of pick) in a few moments. In digging, this spade is found most unwieldy, and it seems extraordinary that the European kinds have not long since replaced it. It serves the purposes of spade, shovel, hoe, and cultivator. The dark-coloured portions are made of wrought-iron, edged with steel, these parts being fastened to the wooden stock and handle by wooden pegs. It costs about 4s. From the spades we come to the ploughs, and these are of two kinds—for cattle or horses, and for hand labour. These are not so frequently employed as the mattock, owing to the small areas of the fields to be cultivated. They are all constructed of hardwood, except the dark shaded parts, which are of wrought iron, with tempered edges. The non-use of ploughs cannot be in consequence of the expense, seeing that they can be purchased at any price ranging from 3s. 4d. to 8s. each. A plough can be purchased at a lower price than a really good spade. Fig. 2 represents a hand plough, and in Fig. 4 this is seen at work. In addition to the handle, a rope is tied round the peg which is attached to the plough shoe, and this goes round the body of the labourer. Figs. 4 and 5 are of a horse plough, and of the same at work. The rollers and pulverizers do not call for much remark. They are clumsy in appearance, and that is all. Neither do the appliances for irrigation, and applying insecticides. The latter is an ordinary syringe, and for the former, a water wheel worked by treading is shown. For harvesting the grain shears are sometimes used, the other implement being a sickle—the blade here being straight. When the grain is gathered in—in every case by hand—it is either threshed out with a rude flail, or with the "hatchell" (Fig. 6). The teeth of the latter are made of iron or hardwood. About three persons work at each of these latter, dragging the heads of the corn through the comb, and by this means the grain is got out. It is then winnowed by being run out from a basket to the floor, a bamboo mat being worked as a fan to blow away the chaff. These are a few of the more interesting of the machines in use in Japan. The almost exclusive use of hand labour in farming operations in Japan seems to preclude the introduction of improved machinery, when taken in conjunction with the comparatively nominal cost of the rude native implements that fully meet the farmer's requirements. It seems that American machinery is only used on the Government experimental farms, while an American merchant has for no less than fifteen years been trying to sell more modern machinery without the slightest success. These machines and tools are too expensive, and are not adapted to either the tastes of the people or to the gardening operations in Liliputian fields, which is

Fig. 1

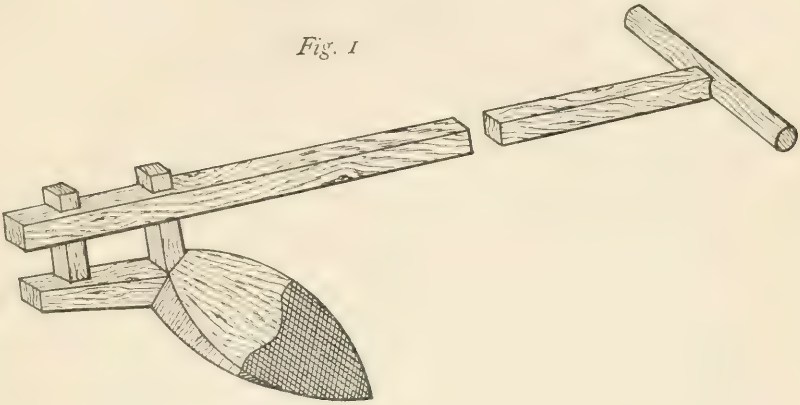
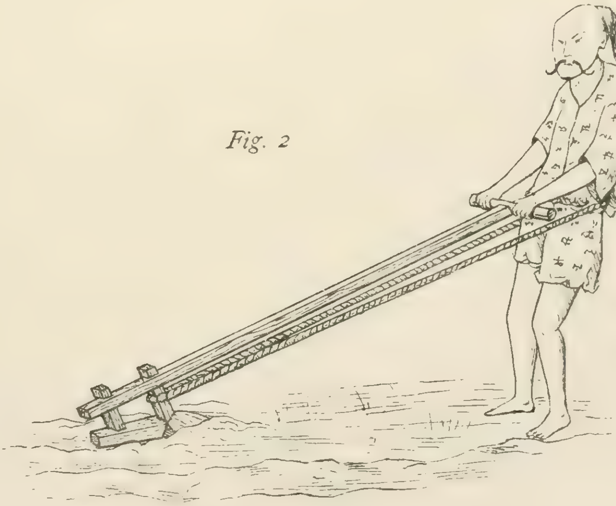


Fig. 2



McLagan & Cumming Edinr

Fig. 1

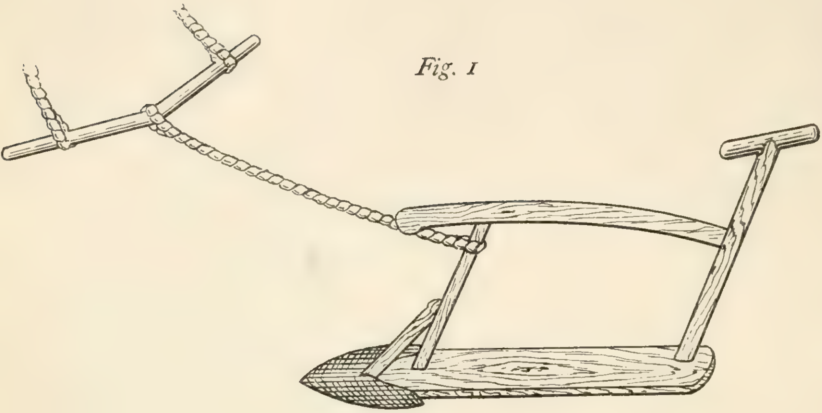
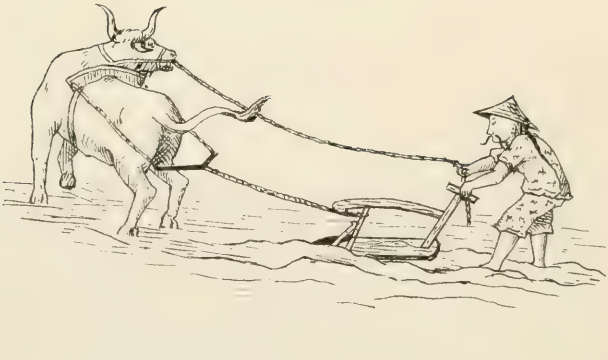


Fig. 2



McLagan & Cumming Edinr

in Japan dignified by the word "farming." Besides, farm labour is so cheap that it is practically impossible to overbid it with labour-saving machinery. Male field hands work twelve hours per day, have five holidays in each month, and receive their food, lodging, and wages, ranging from 10 to 15 yen (£1, 14s. to £2, 10s.) per annum. Female labourers work the same hours, are not entitled to holidays, and receive, beside their food and lodging, about 7 yen (£1, 4s.) per annum. This sketch of the agriculture of the country about the same size as our own, being in such marked contrast to the great exhibition at Preston, cannot fail to be of interest to English farmers.

THE FORESTS OF EUROPE.

BY HENRY F. MOORE, FROME.

SOME statistics on the Forests of Europe recently collected by Monsieur Noel, Bretagne, and given in the *Journal Officiel* at Paris, show that of all the forest wealth of France there only remain in round numbers, comprising the various categories of proprietors, 22,000,000 acres, the greater part of which is composed of woods of almost no practical value, besides a similar acreage, generally the remains of ancient forests that have been destroyed. The state owned in 1791, according to reports of that epoch, 4,213,088 acres; in 1795, 6,406,939 acres; in 1820, 3,001,362 acres; in 1880, 2,777,148 acres: there now only remain 2,389,887 acres. Since the year 1820 more than 741,342 acres of forest belonging to the State have been sold to private individuals. The tract of communal forests and of woodland owned by private persons has decreased in still greater proportion. For the last fifty years more than 1,112,013 acres of forests owned by private owners have been cut down. Austria in the same period from 1790 to 1880 increased its forest superficies by 694,871 acres. During the past twenty years the forests of Bavaria have gained 129,971 acres. The same progression is observed in Switzerland and in the German States. A forest cannot be valued merely according to its extent. An acre covered with trees one hundred, one hundred and fifty, or two hundred years old, will give without doubt in the same period much more considerable and useful product than an acre of trees cut every fifteen, twenty, or twenty-five years, the proportion being as 7 is to 4. In France, only 41 per cent. of the forests owned by the state are planted with high trees, and communes only have 31 per cent. of their forest superficies so planted. The proportion of land covered with high trees to coppice woods is, for other countries, as follows:—

COUNTRIES.	PER CENT.
Bavaria,	95
Hanover,	97
Wurtemberg,	90
Prussia,	75
Saxony,	75
Southern Austria,	95
Hungary,	81

A forest composed of high trees supplies two kinds of product very distinct from each other, both by their value and the nature of the services they render—viz. firewood and woods fit for industrial purposes; the latter being the most valuable. In France, timber does not attain 20 per cent. of the general produce, nearly 81 per cent. of that produce is only good for firewood, while this proportion is in—

COUNTRIES.	PER CENT.
Prussia,	32
Bavaria,	25
Wurtemberg,	35
Baden,	25
Bohemia,	21
Saxony,	44
Hanover,	29
Zurich,	37

France has only 99 square rods of woodland per inhabitant, while the average is in Russia, 135 square rods; in Bavaria, 185 square rods; Wurtemberg, 138 square rods; Baden, 143 square rods; Austria-Hungary, 202 square rods. In France the importation of wood in 1830 amounted to £859,000, it now amounts to £10,730,000, an increase of £9,871,000 in fifty years. The exports for the same period only increased by £1,278,000. Some years ago the occupation of Algeria brought to the French nation nearly 7,000,000 acres of really valuable forests, and two-thirds of these forests belong to the State. They are planted as follows:—

	ACRES.
Cedar trees,	190,163
Aleppo pines,	1,901,308
Evergreen oaks,	1,337,905
Cork trees,	988,456

There is a great deal to do in Algeria relatively to woodland. The German States have numerous schools spread about the country according to local wants. Zurich, Munich, Vienna, Hohenheim, Aschaffenburg, Tharandt, Newstadt, and Eberwald are the centres of so many zones, to which the proper teaching corresponds with the climate, soil, and local requirements. The number of students admitted at Newstadt and Eberwald has been, since the foundation of the school, fifty a year, not including foreigners. In the ancient school of Aschaffenburg, now annexed to the Munich University, the number of native students was, on the average, eighty-one for a surface of 6,000,000 acres of woodland. During the space of twenty-eight years Aschaffenburg has formed 2583 students, including one foreigner, for 124,000 acres. Tharandt has had a yearly average of twenty-nine native pupils and twenty-three foreigners since 1810, although Saxony only possesses 1,167,413 acres of woodland, 396,999 acres of them belonging to the State. In Austria the school of higher studies on forests, carried from Mariabrunn to the Vienna University counted in 1881, 343 students, mostly pupils coming from the secondary schools of Bohemia, Moravia, Southern Austria, and Galicia. The faculty corps is, moreover, seconded by men properly drilled and well prepared, the organization of which dates from the year 1750.

OUTDOOR CULTIVATION OF BRITISH ORCHIDS.

BY A. D. WEBSTER.

UNDER cultivation the majority of our native orchids may be successfully grown either in the open border amongst herbaceous plants or on the rock-work with Alpines; but for various reasons, which will be explained hereafter, neither of these methods is so satisfactory or productive of such good results as when a bed is specially devoted to their culture. All the species may thus be brought directly under the eye of the visitor, not lost sight of, as they are only too apt to be when placed either on the rockery or herbaceous border.

The orchid bed, too, can be formed in a shady, quiet spot where the various qualities of soil may be placed in a very small area, so that different species of similar requirements can grow in close proximity. The position and preparation of the bed will, however, require a little attention, and may be readily formed in any half-shady corner (constant sunshine is inimical to the growth of most orchids) by digging into the ordinary garden soil (which we will suppose in most cases to be loam) a quantity of peat or leaf-mould; this being a mixture suited to the wants of most species. In planting the tuberous or other roots, the requirements of each kind can, however, be readily attended to; it may be by adding lime or chalk to those requiring a calcareous soil, pure loam or leaf-mould where necessary, etc. Limestone blocks or boulders should, where obtainable, be half sunk in the bed in as natural a manner as possible, and against the sides of which those kinds requiring a calcareous soil may be planted with the best chance of success.

When forming this low rock-work, part of the bed should be raised above the general level of the surrounding ground, in order to meet the wants of those kinds requiring a dry soil and situation. The bed should also be carpeted with some low, creeping plants, such as the *Sedums*, *Arenarias*, *Campanula hederacea*, *Linaria Alpina*, or *Anagallis tenella*, all of which are not only ornamental but preserve a cool, moist surface by preventing the too speedy evaporation of moisture, a matter of much importance for the healthy development of the plants. When planting the tubers, these should not be placed at a greater depth than from 3 to 4 inches. A few species, notably *Epipactis latifolia*, the *Cephalantheras*, and one or two others having fibrous roots, are, however, exceptions to this rule, and may, with advantage, be placed at a depth of 6 inches in the ground; but for the various species of *Orchis*, *Habenaria*, *Ophrys*, etc., the above specified depth should never be exceeded.

Although the majority of British orchids are found in a somewhat stiff soil, still in my experience of them, when brought under cultivation, a fair admixture of sand is highly beneficial to most species; indeed, I make it a rule when planting to surround the tuberous or other roots with a handful of rough grit, or sand, which not only to a great extent prevents decay, but materially assists in the formation of roots. This precaution is all the more necessary when planting imported orchids, the roots of which have become damaged in transit or through carelessness in lifting.

With a little care, orchids may be transplanted from their native wilds at any period of their growth even when in full flower; indeed, the latter time is preferable, as the strongest and healthiest plants can always be chosen, and then usually any peculiarity of foliage or flowers is retained under cultivation. In removing the plants, great care should be taken not to injure the roots, as if these (more especially in the case of those having tuberous roots) become in the least damaged, the healthy development of the new offset or root is prevented, although in many cases it may not in the least affect the flowering during the present season.

An ordinary garden trowel or hand-fork—the latter is preferable—may be used for lifting the plants, which should be taken up with a good circular ball of say four inches in diameter (much depending on the size of the plant as well as formation of root), and carefully reduced until the rootlets appear in view; neither these nor the tubers, however, being made bare or exposed. The grassy surface should also be removed before planting, as, be this ever so dwarf in its native habitat, it soon becomes tall and rank when brought under cultivation, causing endless trouble, and often resulting in the death of the plants. Of those who have successfully cultivated most British orchids, not the least remarkable, and perhaps the earliest, was Gerarde, who in 1597 mentions that he had then a plant of *Cypripedium Calceolus* in his garden, and also gives a remarkably accurate figure of the species. Later, about the beginning of the nineteenth century, a number of terrestrial orchids, principally British and Silician, were cultivated successfully in the Botanic Gardens of Glasgow and Liverpool. About the same time (1824) a number of these plants, including *Orchis pyramidalis*, *O. latifolia*, *O. conopsea*, *O. morio alba*, *Habenaria bifolia*, *Aceras anthropophora*, *Herminium monorchis*, *Ophrys apifera*, *O. muscifera* and *Epipactis patens*, as well as a considerable number of North American species, were, it is said, "cultivated with perfect success in the Epsom nursery;" and at the same time most of our British orchids "were cultivated and domesticated with satisfactory results" in the gardens at Welbeck. In the first volume of the *Horticultural Register*, published in 1831, a Mr. Thomas Appleby of Horsforth Hall, is stated to have grown certain species of hardy orchids very successfully in a newly-formed Rhododendron bed. The late Rev. H. Harper Crewe, of Drayton-Beauchamp Rectory, was a great admirer as well as successful cultivator of these plants. He succeeded in getting many of the species of orchis to become established in his garden. A most interesting account of his experiments, with both failures and successes, was given in *The Garden*, volume 21. At Edge Hall, in Cheshire, Mr. Wolley Dod has also been more or less successful with certain native orchids, although his soil and situation are anything but favourable for their culture. At the Trinity College Botanical Gardens, under Mr. Burbidge's care, several rare native orchids have been cultivated, but amongst all those enumerated perhaps no one grows these plants more successfully or enthusiastically than Mr. Elwes, of Preston, near Cirencester. Numerous other examples might be adduced, but enough have already been given to show that these plants may, with a little care and trouble, be as successfully grown out of doors, as the epiphytal members are in our hothouses. It is curious, however, that in some gardens certain species thrive luxuriantly, which in others cannot be coaxed into a short-lived existence. Did space and time permit me, I could enumerate gardens in which, taken collectively, all our native species, with perhaps three exceptions, are grown in the most successful manner. The *Helleborines* are especially difficult to manage, yet I know of one garden in which, for years, *Epipactis latifolia, E. ovalis, E. palustris,* and some of the *Cephalantheras* have flowered well, while in another the rare and beautiful *Cephalanthera ensifolia* has become quite established and runs wild in a rockery where it is almost stifled with the oak fern. The man orchis (*Aceras anthropophora*), a plant that is by no means easily managed, is quite at home in a Cheshire garden. No doubt soil and situation require careful consideration in the cultivation of British orchids; but an equally, if not indeed more important factor is the obtaining of sound, well-rooted specimens with which to start, when, in my opinion, half the battle may be considered won.

Subjoined is a list of British orchids arranged in sections according to their requirements of soil and situation, whereby at a glance any one who wishes to attempt their cultivation will see the conditions under which they are found naturally. Of course, it must not be inferred from the following list that several orchids will only thrive under the conditions there specified, for some species, notably *Orchis mascula, O. maculata,* and *Habenaria bifolia* are by no means fastidious about soil being found in all descriptions, from the finest loam to the stiffest clay; but that the following are the best conditions when brought under cultivation, has been proved on several occasions by those who have devoted considerable attention to this interesting class of plants. In conclusion, we feel justified in saying that the floral beauty of many of our orchids far more than compensates for any little trouble incurred in their cultivation, and, speaking from our own experience, we have every reason to believe that any person giving these a fair trial will not be disappointed with the results.

SECTION 1.

Those which thrive in loam and limestone or chalk with or without shade:—

Aceras anthropophora.
Cephalanthera ensifolia.
—— *grandiflora.*
Cephalanthera rubra.
Cypripedium Calceolus.
Epipactis ovalis.

Herminium monorchis.
Ophrys apifera.
—— *aranifera.*
—— *arachnites.*
—— *muscifera.*
Orchis fusca.
Orchis hircina.
—— *intacta.*
—— *militaris.*
—— *pyramidalis.*
—— *ustulata.*
Spiranthes autumnalis.

Section 2.

Those which thrive in loam and a shadyish situation:—

Orchis conopsea.
—— *maculata.*
—— —— *superba.*
—— *mascula.*
—— *morio.*
Epipactis latifolia.
Habenaria bifolia.
—— *albida.*
—— *veride.*
Listera ovata.
—— *cordata.*
Neottia Nidus-avis.

Section 3.

Those which thrive in leaf-mould, peat, and sand, and usually deep shade:—

Corallorhiza innata.
Epipactis palustris.
Epipogium aphyllum.
Goodyera repens.
Liparis Loeselli.
Malaxis paludosa.
Orchis latifolia.
—— *laxiflora.*
Spiranthes æstivalis.
—— *Romanzoviana.*

Trade Catalogue received.—*Descriptive Catalogue of Forest Trees, Ornamental Trees and Shrubs, Coniferæ, etc.* Dicksons & Co., Nurserymen and Seedsmen, 1 Waterloo Place, Edinburgh.

Notices of Foresters' Appointments.—Mr. Charles E. Curtis, of Alton, Hants, has been appointed consulting forester to Lord O'Neil, of Shaun's Castle, Antrim.

THE ELM.

WRITING to a contemporary recently, Mr. Earley, of Ilford, gives some interesting particulars about this favourite English tree, from which we cull the following:—"It is somewhat doubtful whether any of the species of *Ulmus* we are so well acquainted with are really indigenous to this country. If they are, it is very remarkable that, unlike other indigenous trees, they are incapable of ripening their seeds here, with perhaps rare exceptions, one of which is the Wych elm (*U. montana*). And it is a strange fact in connection with this exceptional seeding of this variety that it rarely, if ever, produces suckers, though the elms are generally so wonderfully prone to this mode of propagating themselves. Hence the Wych elm is usually propagated from seeds, which germinate quickly if sown as soon as gathered, or by the exceptional process of layering. The intention in these notes is to direct attention chiefly to the Huntingdon elm, or *Ulmus vegeta*, of which the American elm, Chichester elm, and Scampston elm are probably synonymous. These elms are well known to be perfectly free-growing trees in all kinds of soils, though in good deep loams the growth is quicker and the texture of the wood better. The Huntingdon elm, raised from seed by Mr. Wood, of Huntingdon, in the year 1746, is far the most vigorous. Indeed, it is so vigorous, that it has been known to attain a height of 30 feet in ten years' growth from the graft. This elm has besides the merit of growing in groups, so as to produce perfect symmetry, however thickly planted, without the need of pruning, which is a great advantage. Excellent timber is also produced more quickly in this way than is customary with other kinds of trees. As a belt for protection of plantations of a less hardy nature, this elm is well adapted, though so seldom used. Probably few kinds of timber will withstand the action of water better, though whilst pine timbers continue to be imported in such bulk the latter will continue to receive prior use. Should the supplies of pine fall short at any time, no doubt properly cut and matured elm wood will again become useful. A few years since it was abundantly used for the keels of ships, and is to this day generally employed in making wooden pumps. Add to these the fact that the tree will bear pruning, and will transplant well, and little beyond need be added in its favour. That elm timber is not so popular as it used to be, cannot be gainsaid. Still it is probable that as good returns may still be made from plantations of it planted with moderate thickness, as accrues to much mixed timber wood at present existing, which only yields its occasional periodical crops of brushwood and faggots, and generally, at rare intervals apart, a fall of moderate-sized oak or mixed timber. Moreover, where, as is occasionally the case, attempts are made to renovate park lands by planting specimen trees on eligible sites, and in connection with which elms are occasionally used, I would strongly advise the use of the Huntingdon, or even the Scotch or Wych elms, in preference to the commoner kind, which in too general a way seems to obtain precedence."

CHEMISTRY.

DIFFERENT YIELD OF PRODUCE FROM THE TWO VARIETIES OF THE OAK.

According to a report made to the Minister of Agriculture by the Agricultural Society of Rhenish Prussia, the two varieties of the ordinary oak (*Q. Robur*, L.), viz. *Q. R. sessiliflora* and *Q. R. pedunculata*, give different yields of bark and tannin. The sessile oak gave 2·52 kilos of bark the 100 kilos of wood, or about 4 lbs. the two cwt., while the pedunculated oak gave only 1 k. 92—or about 3 lbs. In the forests which were very closely planted, the bark gave only 14·78 per cent. of tannin, whilst in those freely open to the influence of the sun, as much as 15·77 per cent. of tannin was obtained. The mean yield of the bark from the sessile variety of oak was 14·62 per cent., and that from the pedunculated variety was 14·13 per cent. of tannin. More bark was not obtained from the trees which were closely planted than from those planted so as to give free scope to the solar rays, the same area therefore containing fewer trees. Digging of the ground between the trees was favourable to their growth, though the financial results of this operation were not tabulated. The *Quercus R. sessiliflora* thus appears the best oak to cultivate for tanning products.

HOW TO MAKE POTASH.

BARON FERD. VON MUELLER, K.C.M.G., of Victoria, writes as follows how to make potash. The wood, bark, branches, and foliage are burnt in pits sunk 3 feet or 4 feet in the ground; the incineration is continued until the pit is almost filled with ashes. Young branches and leaves are usually much richer in potash than the stem-wood, hence they should not be rejected. The ashes thus obtained are placed in tubs or casks on straw over a false bottom. Cold water, in moderate quantities, is poured over the ashes, and the first strong potash liquid removed for evaporation in flat iron vessels, while the weaker fluid is used for the lixiviation of fresh ashes. While the evaporation proceeds, fresh portions of strong liquid are added until the concentrated boiling fluid assumes a rather thick consistence. At last, with mild heat and final constant stirring, the whole is evaporated to dryness. This dried mass represents crude potash, more or less impure, according to the nature of the wood employed. A final heating in rough furnaces is needed to expel sulphur combinations, water, and empyreumatic substances; also, to decompose colouring principles. Thus pearlash is obtained. Pure carbonate of potassa in crude potash varies from 40 to 80 per cent. Experiments, so far as they were instituted in the laboratory, have given the following approximate result with respect to the contents of potash in some of our most common trees:—The woods of the casuarinas, or she-oaks, as well as that of the black or silver wattle, are somewhat richer than the wood of the British oak, but far richer than the ordinary pine woods. The stems of the Victorian blue gum and the so-called swamp tea-tree (*Melaleuca ericifolia*) yield about as much potash as European beech. The foliage of the blue gum proved particularly rich in this alkali, and as it is heavy and easily collected at the sawmills, it might be turned there to auxiliary profitable account, and, indeed, in many other spots of the ranges. In the Queensland coast country the mangrove could be made to yield potash in immense quantities, as it is richer in this alkali than almost any other native tree or shrub; and even if the mangrove were not used for the manufacture of potash, the ash being rich in this valuable fertilizer, could be easily and economically applied for manurial purposes. Of course, British woodmen are aware that it is hopeless to compete with the extensive mineral deposits in Germany whence most of the potash of commerce is now made.

REVIEWS OF BOOKS.

COTTAGES FOR RURAL DISTRICTS.

Dedicated by special permission to His Royal Highness the Prince of Wales, K.G. By WILLIAM MENZIES, Architect. Windsor: Welham Clarke.

THIS is a very suggestive work on a subject now engaging the attention of all interested in the amelioration of the condition of the working poor. The fitness of Mr. Menzies for the task he has set himself is attested by the position he occupies on the Windsor estate, and also by his early training under his father, the author of *Suggestions for the Sanitary Improvement of Labourers' Cottages and of Villages.* The present work consists of brief practical instructions as to the selection of site, water-supply, drainage, etc. It also touches briefly on the desirability of attaching a plot of land to each labourer's cottage, and points out the importance from an economical point of view to both the employer and the labourer of having the dwelling of the latter as near as is convenient to the scene of his work. There are a number of plans of double and single cottages for labourers and for head gardeners and bailiffs which are tasteful in design, complete and convenient in every detail, and well adapted to the purpose in view. A form of specification completes the volume, in which every department of work in connection with the class of buildings treated of is dealt with in minute detail. The work cannot fail to prove useful to all who are directly interested in the class of estate improvements with which it deals.

Familiar Garden Flowers. By SHIRLEY HIBBARD, F.R.H.S.
London: Cassell & Co. Limited.

WE have received the fourth volume of this popular book, which promises to maintain its interest throughout the series. The present number comes out very opportunely at the present time, as it treats of Tulips, Snowdrops, Daffodils, and other bulbous plants. The numerous plates, executed by F. E. Hulme, F.L.S., are alike remarkable for the accuracy of drawing and the delicate softness of colouring. By amateurs the book will doubtless be highly prized, as it contains much useful information, put together in an attractive form.

Selection and Seasoning of Wood. By LE COMTE M. DE VASSELOT. Translated by A. W. Heywood, Forest Department, Cape of Good Hope. Cape Town: W. A. Richards & Sons.

THIS little work is a valuable contribution to forestal literature. It deals with the ripe or mature tree only, but it does so both from the buyer's point of view and that of the seller in a manner complete and exhaustive, and with an excellence of method that renders it valuable alike to the forester and wood merchant. It should be remarked, however, that the information it gives relates to the practice in use at the Cape chiefly; but the principles on which that practice is founded are applicable, under intelligent modification to meet altered conditions, to the requirements of any country in which wood is bought or sold. The first chapter is devoted to a consideration of the structure and composition of wood, and is purely elementary, but singularly free from technicalities. Nothing new is given in reference to the growth, structure, and composition of trees, but the old facts are presented in language which the novice in forestry lore will easily comprehend. Faults and defects in wood are next dealt with, and fifteen of the most common are described, and their influence on the value or quality of the wood indicated in each case. The inspection of wood with the view of testing its fitness and quality for different purposes forms an interesting chapter, in which the means and tests used for discovering many of the defects and faults noticed and described in the previous chapter are described. The tools used in applying these tests are also described, and the mode of measurement in a variety of cases of supposed peculiarity or irregularity is very clearly stated. The time for felling is discussed in a short chapter, the opinions of eminent authorities being given with great fairness, and with the result of proving that winter felling is the most favourable to the securing of the best qualities of the timber. The remaining chapters are devoted to the effects of barking trees; the precautions to be taken for properly seasoning wood; the influence of seasoning on the durability of the wood; and the identification of wood,—all of which are treated in a clear and practical manner.

In an appendix, examples of "completed contracts" and *pro forma* conditions for the classification of logs are given, and "precautions observed in preparing colonial wood for the Railway Department," with other special instructions on matters bearing on the subject from a purely colonial point of view, but not therefore devoid of interest to buyers and sellers of wood in this country.

LETTERS TO THE EDITOR.

SIR,—I thank you very much for naming my trees and shrubs for me, and am very pleased to have your confirmation regarding No. 4, which I have always recognised as a *Magnolia tripetala.* We have a good many magnolias of this kind in Curraghmore, but not one of them has flowered during the time I have been here. The average height of this tree in England, according to Loudon, is from 15 to 30 feet; but we have several specimens which have already attained to considerably beyond the latter height, and are still growing vigorously. Our largest specimen is fully 37 feet in height, and is perhaps one of the handsomest trees I have ever seen. It is growing in a rich alluvial soil on the banks of a tributary of the Suir, and is otherwise favourably circumstanced. This tree, however, is not very fastidious as to soil, as we have it flourishing here in cold, wet, poor ground, in which many of our reputed hardy trees have succumbed. Some of our best specimens, in fact, are growing in land of this description, and though they are not quite so large as the one I have referred to, are yet strikingly handsome trees. "CURRAGHMORE."

DEAR SIR,—By this mail I am sending you a copy of the *Proceedings of the Agri-Horticultural Society of Madras*, containing a letter of mine giving the history of the introduction of the mahogany tree to the East Indies, which would, I think, be interesting to many of your readers. The grand growth of the tree here has lately attracted some attention, and Government is at present, with the assistance of the Kew authorities and the Government of Jamaica, endeavouring to increase it largely.

There is another subject in which I am deeply interested, in which you can probably assist me. There are to the north and south of Madras thousands of acres of sand-dunes which, within the last five-and-twenty years, I and others have covered with thriving forests of *Casuarina muricata*, Roxb. The tree in favourable parts of the sands grows to a noble size, and that very rapidly. I have many 40 to 60 inches in girth at 5 feet from the ground, and tapering up probably 90 or 100 feet as straight as and very like a larch planted in 1871. A few trees are cut for poles, shed-building, rails, and such-like uses, but hundred of acres go down in a very immature state every year for firewood. The wood is very hard, of great density and specific gravity, and bears a great strain, but is so liable to warp, perhaps from ignorance of the proper method of seasoning it, that it is very little used for other purposes. I have seen the wood take a very high polish, and some good tables and other articles of furniture made of it. It appears to me absolutely sinful to waste the well-grown trees for firewood, and it has occurred to me that there might be a market for them at home for paving blocks, even if the wood will not season to prevent warping. The logs could, I believe, be profitably put on board ship at from £1 to £2 per ton.—I am, dear sir, yours faithfully,

Joseph Steavenson,
Honorary Secretary.

Agri-Horticultural Society's Gardens,
Madras, 28*th September* 1885.

ESTATE WORK.

MR. EDITOR,—I have long thought that any one reading our monthly calendar, and who knew nothing practically of forestry, would very naturally conclude that it embraced every description of work done upon a landed estate. Why and wherefore, it may be asked, should all kinds and description of work be classed under forestry and described as such? With your permission, I would suggest that there be one general heading for all, viz. "Estate Work," and that it be divided into different heads, one of which to embrace *Forestry.* The subdivisions, again, should comprehend roads, draining, fencing, hedging, river and burn embanking, bridges, and all kindred works.

Policies.—Under this heading, again, the making and maintaining of drives, walks, grass, shrubberies, hedges, fences, and innumerable other works may be described to the interest and instruction of your readers.

Game.—Under this heading, planting and maintaining game covert, shooting rides. Growing and supplying plants for ground game, food, etc. etc. Fishings in lakes, rivers, etc. Gardening, farming, farm-steadings, cottages, etc. might also, if desirable, be included in the list of rural subjects.

I do not say all these subjects should be treated of in the *Forestry Journal* as of equal importance, but for my part I see no good or justifiable reason for not writing upon them as well as many other rural subjects treated of in the *Journal,* which have about as little to do with forestry as a horse has to do with an axe. I shall be pleased, sir, to hear your own mind on the subject, or that of any of your numerous correspondents interested in the subject of forestry.

A Learner.

20*th October* 1885.

THE FRUIT CONFERENCE.

DEAR SIR,—In view of the Fruit Conference to be held in Edinburgh next month, it may be worth your while to reproduce the following remarks by an able writer in a contemporary on the important subject of Fruit Collections, in which our American cousins are so far ahead of us :—Collections of fruit seem now to be appreciated in proportion to the number of varieties which they contain, rather than because of their actual merits. It is better to be contented with a few really good kinds, such as will be productive in most seasons, than to plant many sorts (even if finer) for the sake of variety, but from which a crop is obtained only in very favourable seasons. Some grow a great variety for amusement; others, in order that they may be able to stage a large collection for exhibition. Such cultivators are well able to take care of their own interests; but those who have either formed a new garden, or are about to renovate an old one, require some definite information, both as to the preparation of the ground and the selection of sorts. Some soils are better fitted for the cultivation of fruit trees than others, and some districts, such as the neighbourhood of Maidstone, have become famous for the quality of the fruit produced there. The soil and climate of Kent are not, however, to be found everywhere. We must take both soil and situation as we find them, and do the best we can with them. A deep, medium clayey loam is best for fruit trees; and shallow sandy soil, on a gravelly foundation, about the worst. It would be injudicious to select the latter for a fruit garden; but when on such soil a house has been built, with a garden attached to it, there is no alternative but to make the most and the best of it. I well remember my first experience with a garden of this kind; an old garden it was too, and full of fruit trees in all stages of decay; even young trees, that had been planted to fill the places of those that had died of old age, fell very speedily into decrepitude. Some of the old trees could, by means of a vigorous push backwards and forwards, be torn up by the roots, owing to their advanced state of decay. I found that it would not do to root up all at once, as many of them were bearing fairly good crops, but poor in quality. The plan I adopted was to clear a portion of the ground and trench it, grubbing out all the old roots. I found the soil to be of various depths; some of it was 30 inches deep, and in other places the gravel cropped up to within 6 inches of the surface. To plant fruit trees in six inches of soil would be to court failure; but, as it happened, we require gravel, and so a foot or more of it was taken out and replaced with good soil, thus giving 18 inches in depth instead of 6 inches. There was not much of this sort of work done, but the whole of the ground was trenched and manured. This was not sufficient, and until the ground could be prepared by being re-trenched, the trees were only planted temporarily, close together at first, so that they could be made to fill a more extended area as they increased in size, and the old worn-out trees were gradually removed to make room for them. Another necessary and important part of fruit tree culture is to thoroughly work the ground after it has been trenched. The *modus operandi* is as follows. The ground should be trenched and manured as early as possible in the autumn. In November the trees should be planted; in doing so, dig out a hole rather larger than the extent of the roots, and before planting cut off any mangled roots which may have been bruised during the process of lifting. If the soil is of a light, sandy character, some good clayey loam ought to be placed round the roots at planting time. I place half a barrow-load round the roots of each. Some will doubtless think this an unnecessary expense. The trees, of course, will grow and thrive without it, but they do better with it, and there are people who do not mind a little extra expense in order to obtain the best results.—I am yours, etc., J. B.

FOREST WORK FOR THE MONTH.

ENGLAND.

"GLOOMY NOVEMBER" is again upon us, with its usual characteristics of darkness, mugginess, and wild stormy winds; yet the average rainfall is not so great as in some of the other months. Last November rain fell at the following places as undernoted:—

At Bristol,	rain fell on	13	days to a depth of	1·68	inches.
,, Glasgow,	,,	12	,,	3·27	,,
,, Edinburgh,	,,	14	,,	1·45	,,

An inch of rain means a gallon of water to nearly every two square feet of surface, or about 100 tons of water per acre. How acceptable a portion of that would have been during last July and August, when vegetation of every kind stagnated under the scorching rays of the sun, unblessed by a single genial summer shower for weeks together.

ORCHARD.—Grounds intended for planting should be properly trenched and got ready for the reception of the plants as soon as convenient after the fall of the leaf. Should the weather be dry, a copious watering may be necessary to consolidate the soil about the roots. When the leaves have all fallen, pruning may be begun in the orchard, and continued as circumstances will allow. But the sooner the work is completed the wounds will more speedily harden, and the process of covering over be accelerated in the spring.

FENCES, especially hedge fences, demand an important degree of our attention this month, when old hedges should be renovated, as soon as they are free of leaves, by cutting, plashing, and laying. It is a bad and pernicious style of renovating such hedges to lay or pack dead wood into weak or gappy parts of the hedge. This only chokes up any live stuff that might otherwise grow if left open, and perpetuates and extends those defects which the operation was intended to remove. Young hedges planted at this season, particularly if upon dry ground, will be found to be more successful than those planted in the spring. Cultivate and clean both sides of all young hedges, and make up any deficiencies with well-rooted and strong hedge plants. Where the ground is poor and light, some fresh soil or manure may be put about the roots, to encourage their growth.

PLANTATIONS.—Push forward forest planting, particularly on dry situations, during this month. Pruning and thinning may also be proceeded with, as well as the felling of timber and coppice woods.

PLEASURE GROUNDS.—Collect fallen leaves before they become sodden and battered to the ground, and remove to the depots as soon as collected, to preclude the possibility of their being re-scattered over the ground.

NURSERY.—Finish collecting the seeds of trees, and dispose of them according to their necessities, laying some in heaps to rot, and spreading others in the drying lofts as they respectively require. Ridge up nursery plots as soon as they become vacant. Transplant young deciduous stock, and plant stocks for grafting ornamental kinds.

DRAINS and ditches should be kept clean and clear, to allow of a free discharge of their waters. And drains in agricultural lands should be examined and repaired before the frosts of winter set in, or before the rains we may expect towards the end of the month set in and saturate the ground.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

THE forest work proposed to be done this month, so far as relates to this estate, consists of thinning and pruning young plantations, cutting timber for auction sales and general estate purposes. Making new drains and cleaning old ones. Erecting new fences of various kinds and repairing old ones. Planting in the forest generally and removing single ornamental trees and shrubs. Making new roads and keeping old ones in repair. Filling in tracts, keeping the side ditches clean and clear of soil, leaves, etc. Charcoal-making to be completed for the season.

The sawmill and timber yard may now be supplied, and all blown trees and odd pieces collected and sawn into whatever they are fit for. Plants may now be lifted, and all ground not under trees dug over or trenched as required. Hedges now to be pruned, and all overgrown ones reduced and put into shape. Winter digging of young hedges to be carried on as weather allows. New hedges to be formed, and in doing so, great pains should be taken in trenching the ground properly, as little can be done afterwards if not done before planting. C. Y. MICHIE.

CULLEN HOUSE, 21*st October* 1885.

SALES.

THE annual wood sales in the plantations of Cullen House took place on Saturday the 24th October, when there was as usual a very large attendance, and the excellent quality of the wood brought purchasers from long distances. Larch, ash, elm, and wood for country purposes in general sold at their ordinary prices, and for which there was keen competition. Basket willows and brushwood also brought good prices, fully equal to former years. The demand for burnwood was rather less than last year, and prices were behind, fully 10 per cent. The best oaks and Scotch firs for boat-building brought fair prices, though hardly up to former years, while for timber of the second class there was very little demand. The circumstance accounted for, of the failing demand, is that less than half the usual number of boats are contracted for building this year that were in former years.

CHIPS.

GRASS UNDER TREES.—When difficulty is experienced in keeping grass green under trees in open woods, particularly pine woods where the shade is continuous the year round, sow a little nitrate of soda occasionally throughout the growing season when the weather is moist. This will bring a fine crop of verdure pleasing to the eye and agreeable to cattle.

THE Boston Journal says the real destroyer of the forests is the careless sportsman or hunter, who carelessly or criminally leaves his camp fire to spread, running over, very frequently, thousands of acres, utterly destroying the growth. The careless forest tramp destroys annually thousands of acres of forests where the lumberman deprives one acre of land of its forest growth.

FINE SUGAR MAPLES. — On the grounds of William Allan Richardson, near Louisville, some sugar maples measure 17 feet in circumference.

RHUS.—This genus of trees and shrubs has the reputation of being highly poisonous, but it should be known that all the species are not so. *R. trifoliata*, for instance, produces berries that are eaten and relished by the Indians and hunters. The fruit of *R. aromatica* is also eaten by the natives not only without ill effects, but with pleasure and benefit. They have both a somewhat sour but agreeably aromatic taste.

TYNNINGHAM HORTICULTURAL SOCIETY'S SHOW.—The annual show of the above Society was held in the schoolroom, Tynningham, on Saturday, 3rd October. The exhibits in vegetables were remarkably fine. The late period at which the show was held precluded the possibility of much in the way of floral exhibits, but there was a keen competition in window plants and in hand bouquets, the latter being confined exclusively to the ladies.

MULCHING TREES AND SHRUBS.—In mulching newly-planted trees, or those set for some years, we not only prevent suffering for want of moisture during the dry weather in summer, but enable them to obtain those elements which they require for nourishment and growth. In selecting a material for mulch, one of a fibrous nature, or at least one that will not become compact and hard, after being beaten some by heavy rains, is always preferable to any other. The more plant food the material contains the better, and for this reason coarse litter from the stable or farmyard has no superior for this purpose. Meadow hay may be ranked next in value, then straw, corn stalks, bog hay from low lands, and thence downward in the scale to pine or basswood shavings and sawdust. Almost any material that will shade the surface of the soil and admit air and water will prove of great benefit to newly-planted trees, and frequently restore to health the old and feeble or those stunted in growth from lack of moisture at the roots, and those fertilizing elements that can only be absorbed and utilized when presented in a liquid or gaseous form. Even small stones may answer. —*American Agriculturist.*

HORNBEAM CHARCOAL is highly esteemed in France and Switzerland, where it is preferred to most others not only for forges and for cooking by, but for making gunpowder, the workmen at the great gunpowder manufactory at Berne rarely using any other.

THE BEST TIME TO FELL FIR TIMBER is when the sap begins to flow in the spring. Peel the larch after felling, and immerse the timber in water during the summer months to set the turpentine. Remove it from the water when the heat of summer is over, and place it to dry under protection from weather, but well exposed to air, and it may be relied upon never to warp or spring, while its texture will be hardened and its durability increased.

THE DURABILITY OF THE WOOD OF THE LOCUST TREE AND THAT OF THE OAK has often been compared. In France the wood of the former has been proved to be superior to that of the latter for the purpose of wheel spokes and other purposes where resistance of heavy strain and wear and tear were required. The locust wood is much used also on the Continent for vine props and gate posts, and has been found to last in the latter position for upwards of forty years.

THE WOOD OF AILANTUS GLANDULOSA is, in the opinion of American lumbermen, much more valuable than it has been usually regarded by us in this country. Indeed, here the tree is grown almost exclusively for ornamental planting, and without any purpose of commercial interest entering into the calculations of the planter. It appears in America, however, to be regarded as one of the very best timbers for fencing, for that purpose being quite equal to locust wood and also about equal to oak as fuel.

A NEW "everlasting" wood pavement has been brought out in France. The wood blocks are boiled in a solution of sulphate of copper, sulphate of zinc and chloride of sodium, mixed with a heavy mineral oil, linseed oil and tallow. The blocks are afterward compressed to about one-tenth their original volume. In this state they are said to practically defy wear and tear.

FIFTEEN years ago, the net forest revenue of British India was £50,000. Now it is £400,000. Forest culture has brought about the change.

APPLES IN ENGLAND AND AMERICA.—Mr. Josiah Hoopes, a well-known Pennsylvania authority, has been calling the attention of his brother orchardists to the fact that the two best varieties of 1545 exhibited at the London Apple Exhibition of last autumn bear a different character in America, thus showing the importance of each country depending on its own varieties of this fruit, which he had been told on a visit to an Edinburgh garden that hundreds in the city had never tasted. The King of Pippins, which headed the London list for dessert, is in America a very acid, poor fruit, unworthy of cultivation. The Ribston Pippin, which was third on the list, though a fine fruit on the other side of the Atlantic, is inferior to many other excellent varieties.

BRITAIN'S FUTURE.—England is the largest importer of wood in Europe, requiring 280,000,000 feet per annum more than she produces. Inasmuch as neither Canada nor the United States can much longer spare large quantities, and since no European country can now produce much more than is required for home consumption, while most of them are importers, Great Britain must ere long depend on her own resources. There are extensive tracts of lands in Ireland and Scotland that might be profitably devoted to forest culture.—*Mississippi Valley Lumberman.*

POINTS ABOUT AMERICAN TANNING.—Three months are usually taken in tanning and drying before the leather is ready for sale. Oak and hemlock bark are used to make the liquor. Oak-tanned leather is considered to be of a better quality than hemlock-tanned, and is used in making the more expensive harnesses, belts, trunks, sample cases, and soles of shoes. Hemlock leather is none the less important. Split into different thicknesses by a cylinder, with a tension fine enough to divide a piece of paper, it plays a prominent part in the hands of the inventive Yankee, who makes of it morocco bindings for books, French calf uppers for shoes, kid and pebble goat, misses' and infants' shoes, and, in fact, an endless variety of leather manufactures.

WOOD FOR CIGAR-BOXES.—Mr. F. R. Jackson, of Kew, says in the *Gardeners' Chronicle*, that *Cedrela odorata*, and not the Red Cedar, furnishes the wood of which cigar-boxes are made.

TREE FUNGUS IN RUSSIA.—According to the *Bulletin* of the Society of Naturalists of Moscow, the hitherto unaccountable destruction of pine forests is caused by the ravages of a species of mushroom which takes growth on the surface of the wood, and afterwards penetrates and destroys the tree. Maps are given in which the path of the destroying fungus is traced through the pine woods of Russia.

USE FOR BIRCH BARK.—M. Peron, a Belgian, has discovered a substance in birch bark which promises to be of great importance in the manufacture of many textile fabrics. When the fine bark of the birch tree is distilled, it yields a red oil, nearly one-fourth of which consists of the special phenol or carbolic acid which gives the well-known odour to Russian leather. It is now found that the residue of green tar of the birch yields neither acid nor alkaloid, and it forms with alcohol a solution of great fluidity, which, however, when once dried, is unacted upon by alcohol. It is this substance which will unite with the most brilliant colours, and is used by M. Peron for treating textile fabrics, and will, he thinks, render them almost indestructible.

DISTRIBUTION OF FOREST TREES IN THE UNITED STATES.—The Tulip tree, or Yellow Poplar (*Liriodendron tulipifera*), is limited to a nearly square territory lying east of 90° west longitude, and between latitude 31° and 43°, or almost wholly east of the Mississippi and south of the region of the great lakes, with the greatest density in the region of Kentucky. The White Oak (*Quercus alba*) grows as far north as Georgian Bay and the St. Lawrence River, and west to a nearly straight north and south line running through the western boundary of Missouri, it being most common in the region of Ohio, West Virginia, Kentucky, Tennessee, and Arkansas. The White Ash (*Fraxinus Americana*) occupies almost the same area, although it runs north to Nova Scotia, and the area of greatest density is farther north than the White Oak.

FORESTRY

DECEMBER 1885.

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EDITORIAL NOTES.

SULPHIDE OF POTASSIUM as a cure for mildew, aphides, and other destructive insect and fungoid pests of trees, is equal if not superior to any other application at present in use. Mildew in young quicks or thorns may be arrested or even prevented by timely applications of it whenever it is observed that the conditions of atmosphere prevail that are favourable to the development of the fungus pest. To nurserymen and others who have to rear large numbers of young thorns for hedging, this should be generally known, as it is immensely superior to the clumsy and defective cures usually resorted to by such people. As it can be applied in solution by means of a syringe or garden engine, and leaves the foliage quite free from any clogging sediment, yet rids it of the destructive mildew, it is superior alike in facility of application and in its results. The proportion of the solution is about one ounce of the sulphide of potassium to one gallon of water.

THE importation of mahogany seeds into India appears to be conducted by the authorities with characteristic circumlocution. If a consignment is to be sent from Barbadoes, it appears the order is given by the India Office to the authorities at the Royal Gardens, Kew, who transmit it to Barbadoes for execution. The seeds are then shipped to Kew and thence forwarded to India. The absurdity of such a method of conducting a transaction of this kind requiring the utmost despatch is extreme. None should know better than the people at Kew that the seed of the mahogany does not retain its vitality long after it is ripe, and that a circuitous and dilatory mode of transmission is certain to be more or less fatal to such a consignment. And knowing this, as no doubt the authorities of Kew Gardens do, and also that repeated failures in importing these seeds have already occurred through this cause, surely it is time to ask who is responsible,—the India Office who presumably know nothing about the requirements of the case, or the Kew authorities who do know? We venture to think the responsibility lies with the latter, and that they should devise a better way of aiding the India Office in carrying out their laudable attempt to increase the growth of mahogany in India.

The authorities of Kew Gardens are trying to educate the public in a simple way in regard to the attacks of injurious insects on cultivated plants. In a small hanging case is arranged a model of the plant attacked, accompanied by the insect in its different stages of life that causes the injury. Beneath the specimens and their names are a dozen lines in clear type giving a short history of the insect and a few notes as to the remedy or preventive steps to be taken against its ravages. Twenty different insects have now been prepared and mounted in different cases. The Scottish Horticultural Society have ordered duplicates, and the Haberdashers' Company intend hanging up cases in their schools in the country districts. This happy idea originated with Miss Ormerod, whose labours have so largely benefited agriculturists. Last year she offered a prize for a case illustrating some definite insect attack, and the response was far beyond her most sanguine expectations.

Schools of Forestry in Poland.—We gather from Dr. Croumbie Brown's work on *Forests and Forestry in Poland, Lithuania, the Ukraine, and the Baltic Provinces of Russia*, that the most important establishment for the study of forest science and economy is at Novoi Alexandria. The arrangements seem to be most complete. The institute ranks as a college of the first class. It is constituted in two sections—one devoted to the study of rural economy and agriculture, the other to the study of forest science and forestry, with a farm, forest, and an extensive domain attached to it, the whole being placed under the Minister of Public Instruction at Warsaw. The staff of officials includes a director, inspector, five professors, eight tutors, and three teachers, a laboratory superintendent, a mechanic, foreman of the workshop, land-steward or manager of the estate, gardener and assistant, surgeon, secretary, and bookkeeper, and a superintendent of buildings. No professor can hold two chairs, and any of them after twenty-five years may be again and again reappointed for successive terms of five years each. A Board of Management, consisting of the director, inspector, and two professors, has the charge of expenditure to the amount of 300 roubles, to be sanctioned by the director; the expenditure of sums between 1000 and 5000 roubles requires the sanction of the council; and the expenditure of sums above this amount that of the ministry. The course of instruction embraces a very wide range of subjects. The instruction is given in the Russian language. Each professor and tutor is required to give six lectures a week, and teachers to spend twelve hours a week in class duties.

AFFORESTING IRELAND.—We extract the following from the Report of the Select Committee appointed to inquire into the present condition of manufacturing and productive industries of Ireland:—

"The question of utilizing by Forestry the immense tracts of waste land in Ireland, much of which is incapable of profitable tillage, has also been brought prominently before your Committee, and they would remark that no matter of greater urgency as affecting the future of that country demands serious consideration, or one more intimately bound up with its commercial prosperity. The evidence already given in regard to Forestry appears to point very distinctly to the necessity of introducing an extensive system of afforesting into Ireland. The reintroduction of many industries once flourishing there, such as iron-smelting and the utilization of other metals, proved before your Committee to be abundant, cannot be looked for until charcoal resumes its place as fuel, more especially as the coal supply of Ireland is very small compared with that of England, Wales, and Scotland."

It has also been given in evidence that planting is much needed as a shelter for men and animals, for the protection of all agricultural crops from the force of prevailing winds, for the retention and enrichment of the soil on the mountain slopes, for the prevention of further denudation of uplands, and of the downpour of silt, which, descending in enormous quantities, blocks up streams and watercourses, obstructing drains, and causing destruction by floods and torrents, as in the case of the Bann, the Shannon, and other rivers. The importance of Forestry in regard to all handicrafts and manufactures in which wood forms an essential ingredient has been largely demonstrated, while the industries dependent on the supply of willows and osiers show that a very important manufacture cannot be carried out successfully without an abundant supply of home-grown material.

STEEL *versus* WOOD RAILWAY SLEEPERS.—The Chairman of the Directors of the Staffordshire Steel and Iron Company having written to the General Manager of the Midland Railway Company, touching the report that the latter Company had purchased 10,000 tons of steel sleepers from Belgium, has received the following reply: "It is quite true that the Midland Company has ordered a sample lot of steel sleepers from Belgium, but the quantity is not 10,000 but 3000. We applied to several houses in this country for tenders, and found that they had not at present the necessary plant for manufacturing them; and as it is uncertain whether we shall adopt them generally in place of wooden sleepers or not, they naturally ask us a sufficiently high price for the article to cover the cost of the new plant which they must have put down. The Belgian firm has the plant already. My Directors therefore thought as the quantity required is, as I said before, very small, about 250 tons, and for trial only, it was better to let the Belgian firm supply them than to pay a price for the article very much in excess of that which the Belgian house charges. You may take it for granted that we do not like sending orders out of the country. If the experiment of using steel sleepers is successful, our consumption will be large, and I am sure there are plenty of houses who will then be willing to put down the necessary plant at their own cost, without increasing, by some special addition, the ordinary price of the manufactured article. I will request our Stores Department to send you a form of tender when we are in a position to give any further orders." In this announcement there appears to be trouble looming in the future for the dealers in timber railway sleepers, and for the growers also. But as any considerable increase in the iron trade would create benefits that would not be exclusively enjoyed by that trade, it may fairly be hoped that should the experiment in question succeed, compensating advantages may arise even to the timber trade in its producing and selling branches through the increase of general trade that may be expected in that case to accrue from the impetus that would be given to the iron trade.

THE CALIFORNIAN REDWOOD COMPANY.—Edinburgh readers will be aware that legal measures are in process, notably in the Court of Session, virtually to resuscitate this unfortunate concern, by the handing over of its estates and liabilities to a new company, to be designated The Edinburgh and San Francisco Redwood Company Limited. Omitting criticism meanwhile on the financial aspects of this new venture, some facts on its forestal side may interest. The timber area for the operations of the old company was 70,000 acres. Haulage through woods to a spot where timber rafts might be floated to the steam sawmills, was an outstanding obstacle to success. A railway twelve miles long may now be expected to obviate this; and it will also allow timber carriage to go on steadily throughout the year. The old company could only bring down its saleable products at those seasons of the year when rafts could float down the streams flowing through the forest into the main river. The hollow stump of the redwood into which visitors wandered at the International Forestry Exhibition represented a tree 295 feet high, though only 13 feet in diameter. The largest monarch of the forest, named the St. Rollox from the famous Glasgow Chemical Works stalk, is some 350 feet high. Its neighbours average 300 feet. Though redwood is the predominant tree in the lands, big pines, firs, and congeners also quickly grow up in the interspaces.

THE WHITTINGHAME EUCALYPT.—The article on "Notable Trees at Whittinghame, East Lothian," appearing in our September issue (p. 285), has interested botanical authorities. Specimens of leaves, etc., of the "Swamp Gum tree," there attaining a height of sixty feet, have been sent, as requested, to the Kew Herbarium; and the specific name of the tree has been pronounced to be *E. Gunnii,* not *viminalis,* as it was designated by our contributor on the authority of the late G. Bentham.

THE ISLAND OF ARRAN EUCALYPTS.—The annual report of the continuous growth of such exotics as eucalypts, tree-ferns, and acacias in this well-known health resort of the Firth of Clyde given by the Rev. D. Landsborough, of Kilmarnock, to the Edinburgh Botanical Society, has come to be looked for with interest by arboriculturists. This year three Australian gums have been successfully introduced, which from their native mountain habitats appear to promise a long vitality even in the severer frosts and gales incident to other parts of Great Britain than the lovely isle where they now luxuriate. The white gum (*E. pauciflora syncoriacea*) from the Blue Mountains, New South Wales, planted in 1880 at Craigyard, Lamlash, had not a leaf browned in the severe winter of 1880–81, and is now 18½ feet in height, and 7½ inches in girth. Its leaves, which approach in size those of the blue gum, are covered with a whitish bloom. The leaf of the Alpine gum is large, thick, and remarkably broad, being 9 inches by 4½ inches. It was planted last year at Corrie Hotel within 35 yards of high-water mark, and is now 3½ feet in height. It is a native of the Alpine regions of Australia, and, like some Alpine plants, grows well in the vicinity of the sea. The cider gum or mountain white gum (*E. Gunnii*) has two representatives in Arran; one 6 feet 5 inches high at Craigyard, Lamlash, and a smaller specimen at the Free Church Manse, Whiting Bay. It grows freely in the open air at Kew.

LIRIODENDRON TULIPIFERA

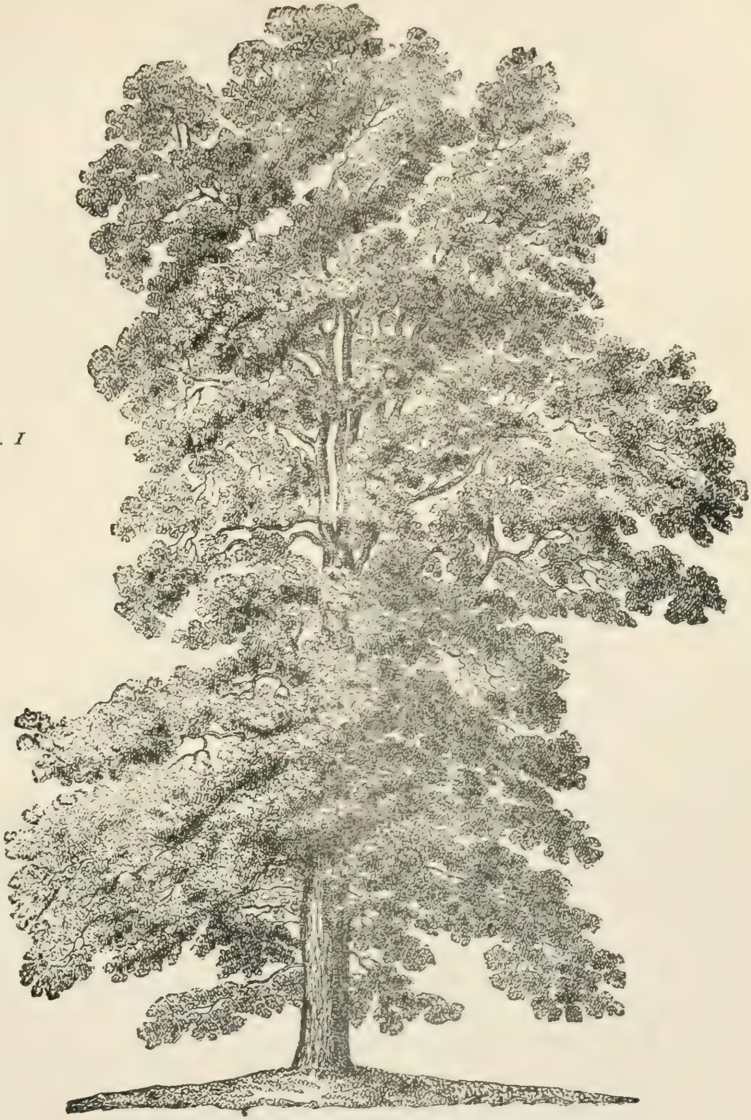
(Tulip Tree).

THIS is the yellow poplar, tulip poplar, and whitewood of the American lumbermen—but these names are pure misnomers. The tulip tree has no affinity with the poplar properly so called, but belongs to the natural order *Magnoliaceæ*, and is closely allied to the genus magnolia itself. It has not even any superficial resemblance to any poplar, and the only probable basis for the two first American popular names mentioned lies, perhaps, in the similarity of its wood to that of the poplar; but even in this respect the similarity is more apparent than real, as the wood of the tulip tree is heavier, and denser in grain, than that of the poplar.

Our illustration, Fig. 1, furnishes an excellent idea of the general contour and habit of the tree, and Figs. 2 and 3 give an accurate representation of the leaves, the flowers, and the fruit or seed-vessel. It will be observed that the form of the leaves is very remarkable. According to the botanists, they are truncately lyrate, and there is no other instance, that we know, of this peculiar fiddle-shaped leaf occurring among trees. The leaves are bright shining green in summer, but die off a bright golden yellow in autumn. The flowers are handsome, composed of six petals, in form somewhat resembling a tulip, hence the specific name, the colours being green and yellow, with brown or red spots. Old trees produce flowers very freely in America, and also in this country, but those under ten or twelve years rarely produce any flowers. The fragrance of the flowers is very pleasing, and form a source of income to the American flower-girls in spring. The seed-vessel is cone-like, about 2 or 3 inches long, consisting of sixty or seventy scales, each enclosing one seed, or the rudiment of a seed, for it is rare to find more than a tenth of the whole number in any one seed-vessel perfect or fertile.

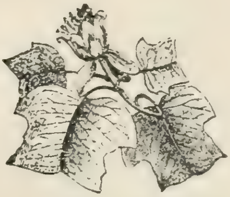
The tulip tree enjoys, perhaps, the widest geographical range in America of any other tree indigenous to that country. It is found in the States of Vermont, New England, Florida, New York, Ontario, Michigan, Illinois, Missouri, Ohio, Indiana, Tennessee, and North Carolina. It appears to reach its greatest development in the last four States named, where it attains the height of nearly 200 feet, with a diameter of trunk of 6 feet to 8 feet. It supplies the well-known "whitewood" of the American lumbermen, which is largely used for cabinet-work, coach-building, and inside furnishings for houses, but is not found suitable for purposes in which it would be exposed to the weather, as it is liable to rapid decay when so exposed.

Fig. 1



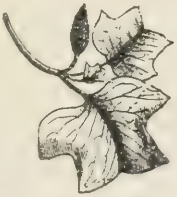
TULIP TREE. (*Liriodendron Tulipifera*).

Fig. 2



LEAVES, FLOWER,

Fig. 3



SEED VESSEL.

McLagan & Cumming. Lithrs. Edinr.

As an ornamental tree the tulip tree is well known in this country, especially in the south, where it thrives better, and attains a larger size than in the north. Its towering, stately style renders it one of the most characteristic and desirable trees for avenue planting, and for solitary trees and groups in picturesque situations. The beautiful green of the foliage in summer, the rich golden autumn tint of the same, and the pleasing fragrance of the flowers, are characteristics which no other tree possesses in the same degree, and should strongly commend the tulip tree to all who plant for ornament, in any part of the country in which it is found to thrive. It is fond of a good, rich, well-drained soil, and is in the more favoured parts of this country a rapid grower.

OAKS IN MONMOUTHSHIRE.

MONMOUTHSHIRE, though a small county, is richly wooded, and is noted for its oak (*Quercus*). The oak grows in great plenty all over the county, and seems to thrive and make valuable dimensions on most soils. There are hundreds of oak trees felled annually in the county for scantling for railway waggons, spoke-making, and ship-building. There are some very fine specimens to be seen in the neighbourhood of Newport. One most worthy of notice, stands in a meadow belonging to Pencraig Farm, occupied by Mr. Rees Keene. This grand old tree is supposed to be very nearly a thousand years old. It is in every sense a monarch, and is in sound and perfect health. Its dimensions are as follows: height of trunk to the first branch, 15 feet; circumference, 38 feet; the smallest diameter of the butt is 27 feet. The tree, including branches, contains from 950 to 1000 cubic feet. The spread of the branches is 36 yards. The soil which it grows upon is a red clay on the red sandstone. There are some very fine oaks in Tredegar Park, owned by the Right Hon. Lord Tredegar, Llantamam Park, and at Llansoar. In fact, very fine oaks, in reality giants, are to be met with in many quarters of the county. It was at Baesalleg, near Newport, where the famous Gollynos Oak was felled. On the moorlands, near the coast of the Bristol Channel, the soil of which is a blue clay, with a cold bottom, the oak does not thrive. We once had a very fine oak at Whitsun, near the banks of the Severn, which contained 150 cubic feet of timber. This was, I believe, the last of the oaks containing timber of good quality on these moors. They are generally rough, scabby, and very small, and when felled they mostly turn out to be rotten in the heart. We had some very small trees felled last spring, all of which had holes in their butts.

THE EDINBURGH APPLE AND PEAR CONGRESS AND CONFERENCE.

THIS important show of the Royal Caledonian Horticultural Society was formally opened on the 25th November by the Marquis of Lothian, assisted by the Lord Provost of Edinburgh and a number of bailies and councillors. The Marquis of Lothian, in his opening address, alluded in general terms to the object which induced the Council of the Royal Caledonian Society to engage in this new departure in the development of their shows. The Society has not for many years held a show in winter. But on account of the generally good crops of apples and pears throughout the country, it was decided at a meeting of the Council of the Society, held on the 14th August last, that it was a favourable opportunity to hold a special exhibition of apples and pears, and therewith also a conference of leading authorities on the subject of Pomology—with the view of comparing and correcting nomenclature, and testing the qualities of the almost innumerable varieties of apples and pears grown in the various districts throughout the country. Collections have been solicited from all quarters, and the response has been amply gratifying. Samples have been sent in in abundance from the most favoured counties of England, from Wales and Ireland, and from nearly every county of Scotland, and even from so far north as Orkney.

The result is an unparalleled exhibition comprising something close on 12,000 dishes of apples and pears, or about 50,000 samples in all. These are arranged in the Waverley Market on four tables extending the entire length of the hall on the north side, with three tables at the west end, and being in all about 600 yards by 4 feet wide.

The exhibition is thoroughly representative of pomological interests of all parts of Great Britain and Ireland, and there are also samples from Nova Scotia and Germany.

The leading fruit-growers in the country have sent in samples from their various districts, along with information furnished by the exhibitor bearing on the name or names by which each sort is known in the district in which it is grown, the stock on which it is grafted, the use whether culinary or dessert, the season or period of use, the bearing qualities, and other information of a practical kind, all written on cards specially designed and sent out to each exhibitor by the Society. There is thus brought together a mass of information relating to the two important fruits exhibited, which, in the hands of the Council of the Society, cannot fail to be of immense practical advantage to all interested in fruit-growing in every part of the country. No doubt it is their intention to publish a full report of the proceedings and the results of this important Conference, as was done two years ago by the sister Horticultural Society of England, in respect to apples alone, on which occasion it held a similar exhibition.

That there was much need for such a step on the part of some constituted authority such as the Royal Caledonian Horticultural Society, will be conceded by every one who has to do with the culture of the apple and the pear; and the thanks of all so interested, and also of the general public, who will in the end derive the greatest if not the most direct benefit from the results, are due to the council and committee for having instituted the Conference, and brought it so far to a most successful issue. It has been a laborious task, but has been accomplished in a manner thoroughly creditable to every one concerned.

It is not in our power to do more than take a rapid glance at the more salient and striking features of the show at present, but we may have occasion to return to the subject in a future issue.

After making a survey of the exhibition, the first and most lasting impression on the mind is the extraordinary contrast that exists between the high-class quality of the samples from Kent and Surrey, and the miserably poor samples from Orkney and other northern districts of Scotland. Climate has fixed the line of possible perfection in the cultivation of the apple and pear a long way south of Orkney, and the most hardy varieties, samples of which appear on the exhibition tables, are so very inferior as to suggest that apple-growing can be carried on in Orkney only as an interesting experiment. It cannot pay nor prove satisfactory in any sense.

Generally regarded, apples and pears are rather under-sized this season, owing to the long-continued drought which prevailed throughout early and mid summer, but the crops are generally good and the quality very fair. The most splendid samples, taking the collection as a whole, came from Messrs. Bunyard & Co., Maidstone, Kent. The collection comprised 300 varieties, many of which were of the highest excellence. Some of the more remarkable varieties were Coxe's Orange Pippin, the samples of which were superb; Blenheim Orange, remarkable for great size and splendid colouring; Golden Noble, a most attractive sample of great size and beautiful golden colouring on all sides; Gascoigne's Scarlet, very conspicuous as regards colouring; Reinatte du Canada, grand alike in size, perfection of form, and colouring; Warner's King, very fine; Annie Elizabeth, great size and handsome; Lord Derby, very attractive and handsome in form and colour. Pears in this collection were extremely fine, large, luscious, and tempting. The following are a few of the most notable: King

Edward, Conseiller de la Cœur, Beurre Rance, Triomphe d'Jodoigne, Doyenne du Comice, one of the finest pears exhibited, and also capable of being fairly well grown in the northern parts of the country; Beurre Diel, Calabasse Grosse, and Beurre Bachelier were also superb samples of pear-growing, surpassing even the famous growths of France.

Messrs. Veitch & Sons, nurserymen, Chelsea, contribute 250 varieties of apples and pears, all of the highest excellence, quite equal if not in some instances surpassing in size those from Maidstone, but generally not so highly coloured. Some of the most noticeable apples were Bismarck, a grand sample; Royal Russet, Sturmer Pippin, Alfriston, King, all very fine; Lady Henniker, large and handsome; Gloria Mundi, Reinette du Canada, Dumelow's seedling—Wyken Pippin and Winter Hawthornden; and among the pears were specially fine the following ones: Duchesse d'Angoulême, Beurre Diel, Beurre Bachelier, Easter Beurre, Beurre Clairgeau, a superb sample; Hacons, incomparable, and Beurre Baltet.

The Royal Horticultural Society of London has a grand collection of very superior fruit. Among the apples were the following, remarkably fine: Braddick's Nonpareil, Sweney Nonpareil, Court Pendu Plat, Cox's Orange, Cellini, Blenheim Orange, Pitmaston Russet, Bauman's Red Winter Russet, Emperor Alexander, and Lane's Prolific. Among the pears the following were striking for size and fine quality: Marechal Vaillant, Passe Crassane, Doyenne du Comice, Marechal de la Cœur, Forelle, Docteur Lindley, Beurre de Anjou, Beurre Diel, and Duchesse d'Angoulême. There is a very fine collection from Mr. Watkins of Hereford, comprising 206 varieties of apples and pears. Among the former is a very interesting batch of cider apples, remarkable for their high colouring, but generally small. The whole of this collection is conspicuous for its high colouring, but is generally inferior in size to those from Surrey and Kent.

Buckinghamshire sends a very notable collection from Mentmore, the seat of the Earl of Rosebery. There were over 150 varieties, all marked by high excellence and very superior colouring.

The largest collection in point of numbers that came from England was that from Messrs. Little & Ballantyne, of Carlisle. It comprised about 600 dishes of apples and pears collected from all parts of Cumberland and Westmoreland, and showed an interesting variety of quality and features incidental to the districts whence they were collected. Many other counties of England were represented, but space will not admit of their being particularized.

Wales was worthily represented by a very fine collection of 100 dishes from Mr. Loudon, gardener, The Quinta, Chirk, Denbighshire.

Ireland was represented by seven counties, each of which sent collections of good average merit.

Nova Scotia.—The Government of this Colony (through Professor Lawson, an old Edinburgh man) sent a very superior collection of apples. Many of the samples were of first-class merit. Among the best were Blenheim Orange, perhaps the finest sample of this sort in the whole exhibition ; Gloria Mundi, Gravenstein, Golden Russet, Mammoth Russet, a very superior sample ; Catkin's Pippin, Fox's Pippin, and Northern Spy, the latter very fine.

Germany.—From Herr Strasser, Innsbruck, came a collection of seven dishes of very attractive appearance. They were only medium-sized fruit, but models of form and brilliant colouring. The most remarkable were Red Noble, Kalterer Bohmer, and White Rosemary.

Ireland sent representative collections from six counties, all of more than average merit. There was a nice collection from Messrs. Roger, M'Clelland, & Co., Newry.

Scotland is very largely represented, nearly every county sending in collections of varying merit according to the latitude and elevation whence each has been sent. Midlothian sends the largest number of samples, which on the whole are of very superior quality, especially as regards apples ; but pears are comparatively few and of ordinary quality. The most remarkable collection is that put up by Mr. Dunn, The Gardens, Dalkeith, which musters 260 varieties of apples and pears, many being of excellent quality. There was a good collection of apples and pears from Messrs. Ireland & Thomson, Edinburgh ; a large collection from Messrs. Dickson & Co., nurserymen, Edinburgh, along with which were exhibited excellent samples of fruit trees, illustrative of the different styles of training from bushes to standards, cordons to espalier, and fan and horizontal trained trees for walls.

Roxburghshire was rich alike in quality and numbers. Messrs. Ormiston & Renwick, Melrose, had a very considerable collection gathered from various parts of the county, exhibiting fair quality, and Messrs. Laing & Mather, Kelso, with a smaller collection, exhibited more uniform excellence ; but it was among the collections from private growers that the fullest capacity of the county for fruit-growing was illustrated. The collection exhibited by Mr. Melville, Elliston Gardens, St. Boswells, is a remarkable one, in some respects one of the most remarkable in the show, not so much as illustrating the capabilities of the particular district of this county in which the samples were grown, as what may be done by means of glass protection applied on the orchard house principles to produce the highest possible results in apple and pear culture in climates adverse to the production of the best varieties of these two fruits. The following apples were superior in size and finish to any other samples of the same sorts in the show: Melon Apple, Washington, Belle Dubois, Calville Blanche Court, Pendu Plat, and King of Tomkin's County; the latter an American variety of striking character, as regards size being the largest of any in the exhibition. The pears, of which there are 44 samples, are equal to anything of their kind from the most favoured districts in the English section of the show. Other very noticeable collections from this county were that from Mr. Galloway, Minto House, Hawick, and Mr. Fowler, Milton, St. Boswells, the former comprising 120 dishes of apples and pears, and the latter 70 dishes, each above average merit.

Stirlingshire was well represented by a large collection from Messrs. Drummond & Son, nurserymen, and several private collections, all of fair average merit. Messrs. Drummond's collections contained some excellent samples of Pitmaston, Duchesse, Marie, Louise, Beurre Rance, and Beurre Diel pears.

Aberdeenshire is for so unfavourable a county well represented both in numbers and quality. There are two collections put up by nurserymen and two by private gardeners. The largest and most representative collection is from Messrs. James Cocker & Sons, Aberdeen, and the next in numerical importance is from Messrs. Smith, nurserymen, Aberdeen; the latter contains samples of apples from several more northern counties, and cannot therefore be regarded as purely representative, but generally the quality is fairly good. Messrs. Cocker's collection is a representative one in so far as the climate of Aberdeen is concerned, as it is collected from all parts of the county and several districts of the adjoining county of Kincardine. Many of the hardier varieties of apples are put up in the collection in very fair quality. The two private collections are from Mr. Donaldson, the gardens, Kintore, and from Mr. Forrest, the gardens, Haddo House; the former comprising 72 dishes of very good fruit, and the latter 24 dishes also good.

Morayshire had its principal representative in Mr. Morrison, nurseryman, Elgin, who tabled an interesting collection of 120 varieties of apples and pears, the former generally good, the latter comparatively poor; Mr. Chrystal, Altyre Gardens, Forres, 50 dishes apples and pears, which, considering the locality, were well-grown samples.

Forfarshire is well represented in the number of dishes sent. The principal in point of numbers is from Messrs. Laird & Sinclair, Dundee, who put up a large and varied collection of apples with a few good pears; and Mr. Johnstone, the gardens, Glamis Castle, tables a very excellent lot indeed.

THE WOODS IN AUTUMN.

FREED from the toil, the turmoil, and the conventionalities of a thoroughly artificial existence, there can be nothing more soothing to the properly organized mind than to recline half-buried in the ferns and tangled grasses that clothe the banks of this laughing sunlit stream. Here in truth is rest for both mind and body, and here we may drink to the fill the cup of enjoyment we promised ourselves; for is not this the very essence of that relaxation which, when parched and weary, we have looked forward to, as soon as ever the leafy forest had become touched with a glamour of gold and crimson and brown, as soon as ever the month of October had been ushered in with all the glory of its autumnal colouring?

And the variety of tint is as interminable as the number of combinations possible to be produced upon the musical scale, nay, rather, as countless as the sands upon the sea-swept shore.

See there across the stream how each individual tree is clothed in its own garment, and even upon each leaf of each of these trees may be noticed a fresh shade or a novel arrangement of colour; and see too how this endless combination of minute particles blends into one gloriously harmonious picture, soothing alike to the eye and through this medium to the senses. How the mass of foliage glows again, for a great fleecy cloud has passed across old Sol's face, who, smiling genially once more, sends forth a flood of light, bringing with it fresh touches, and splendid and ever-changing effects of light and shade. And see upon the hill forming the background how rich is the foliage of the Scotch pine. Their warm red stems call for special admiration, and here produce a pleasing contrast to the surrounding clumps of birch in their soft russet brown suit, which so strangely corresponds to the garment they wear in early spring before the enveloping sheaths drop away from the bursting buds. Following the slope of the hill, a few fine beeches attract attention. They actually seem possessed of a power of giving forth light, for even now rays of gold and copper flash from the upper sprays swaying in the freshening breeze, as if to enliven the still sombre green of the middle and lower branches. These in their turn are succeeded by the almost geometrical columns of a clump of spruce fir, which give place farther down to a round-headed scyamore with its pure delicate yellow foliage, while a great Spanish chestnut, only now acquiring its first touches of golden brown, overhangs the stream where it bends away to the left and is lost to view.

But what about the animal and insect life, without which the most favoured locality becomes a dreary solitude? For life and motion we have not far to seek; for in and out among the curved roots of the alder which springs from the opposite alluvial bank, a weasel—the very emblem of stealth and activity—has been twining his lithe body and hurrying to and fro as if imbued with a demon of perpetual motion.

Doubtless he is fully aware of the presence of that fat, round, and innocent rabbit, whose ears have been visible above yon tuft of coarse grass for the last few minutes, and whose four brothers presently make their appearance from some invisible burrow and join in an exciting game. See how one springs high into the air with a ridiculous affectation of mingled surprise and fear as his fellow charges at him, and see too how a little later they all circle in merry chase round that sheep-trimmed furze-bush—evidently the last figure of the game, for now two or three have settled down in a business-like fashion to their evening meal, while the remainder, throwing themselves at full length upon their sides, seem to revel in the full warmth of the declining sun.

Nor is bird life wanting, for two plump blackbirds are deeply engaged amid the boughs of the mountain ash to the right, now decked out in the full pride of its crimson fruit, of all berries the choicest and most eagerly sought after by most of our British birds. A solitary crow appears to take a serious view of things in general, as he solemnly stalks about in the shade; a sprightly water-ousel has been darting to and fro across the stream, now alighting and taking a plunge from one half-submerged stone, now from another; a solemn heron, still as death itself, stands knee-deep where the glistening gravel forms a shelving strand near the bend to the left, and here and there through the surrounding foliage a short note or two, or a gentle rustle, denotes the presence of other inhabitants—invisible no doubt, but the knowledge of whose presence seems to dispel any sense of loneliness, and even to produce a feeling of gratification and contentment.

But what comes dropping down through the leafy beechen canopy overhead, and pattering upon the hard surface at the base of the great grey stem, or falling noiselessly among the tangled grasses and tall bracken? A squirrel, or probably two, are busy up aloft, severing the stalks of the husks containing the oily beech-nuts. By and by they will no doubt descend, and ranging round will collect the valuable spoil (for they have already been careful while above to pass over each blank or "blind" husk that may have come in their way), and will then carry it away to some place of security as a reserve for the coming winter.

An old-fashioned writer has said: "The first meditation of a solitary is the behaviour of men in active life." But rather, in the depths of this seclusion, the behaviour of the varied forms of animal life may well be considered an instructive, if not a more diverting subject of meditation; for here, not only in the immediate neighbourhood, but among the surrounding trees and upon the undulating sward, much may be seen to give food for interesting speculation, not only as regards the passions, sensations, and desires, but also upon the inscrutable instinct possessed by that section of creation which we—the lords of it, no less—designate as the lower animals.

But the time has come when this "Lord of Creation," lying prone amid the tangled underwood, must unwillingly draw his wandering fancies to an abrupt conclusion, for an insidious draught which comes creeping over the surface of the ground calls his attention to the fact that the sun has set in a crimson glow, and reminds him that this October day with all its glorious beauty cannot last for ever.

R. E. H.

CLOSE WOODS OR OPEN?

"LUCUS â non lucendo" might supply an appropriate motto for a cautious and economical wood culture. This scrap of primitive philology claimed to explain the origin of the Latin name for grove, and, whether it be absolutely accurate or a mere guess hazarded by some ancient grammarian, yet records for us the fact that groves in old times were dusky and closely shaded. So they have been also at all times and in all ages wherever wood has been long left unhindered and unassisted to the care of nature. Nature's management of woods is by no means to be despised, but, on the contrary, is deserving of close attention and imitation. Of the £20,000,000 worth of timber which is yearly imported into the United Kingdom, by far the greater part has been produced in natural forests. The excellent timber reaching us from Scandinavia, Russia, and Canada has seldom known the fostering care of any forester. In the following brief remarks the endeavour will be to show that groves ought still to preserve their ancient and natural character; that woods ought to be close, and closed overhead against the sun; that they ought to be dusky and dark, and densely shaded.

The question gives the choice of two alternatives. Ought the trees in a wood to be maintained in close order? or, on the other hand, is it more important that crowding should be avoided? It will be understood, of course, that the question is stated with a general reference to woods which are to be permanently maintained and utilized for economic purposes. Great stress is by some laid on the avoidance of crowding. Thin planting is recommended with early, though unremunerative, thinnings, and thinnings at all stages which may be described as severe. It has been recommended in the same connection that the trees in a wood should be separated and individualized, that the extremities of their branches should at all stages be free from those of their neighbours and not touch nor interlace. Let us now by way of illustration exaggerate in an imaginary example the precautions and tendencies of this system of separating the trees in a wood. To push these tendencies to an uttermost extreme, let us contrive an imaginary wood, in which the trees shall be so separated that thinning may be altogether dispensed with; by planting our wood with, say ninety trees only per acre at 22 feet apart, we should avoid all necessity for thinning. Suppose, now, a tree-guard of paling with rabbit netting could be allotted to each tree, the wood might seem well equipped and almost independent for life. If each circular tree-guard enclosed a space of 3¾ square yards, then they would occupy altogether not more than 340 square yards per acre, and would leave 4500 square yards per acre open for grazing. This scheme might seem plausible, on paper at least, to any one unacquainted with practical Forestry, seeing that so much land is gained for pasture apparently without detriment, and because the grazing cattle would greatly fertilize the soil, while the success and development of the trees seem sufficiently provided for. But consult any forester, and he would tell us that a plantation so raised, however carefully it might be treated, would neither be satisfactory to the practical woodman during its growth nor be apt to excite keen competition among timber merchants when it came to be disposed of. Even though he should not himself advocate close woods with continuous leaf canopy, a forester would yet desiderate a closer juxtaposition of trees with successive thinnings. We may see from consideration of this example that the habit of trees and the success and character of a wood is not dependent entirely on soil, climate, and species, as is sometimes assumed. The manner of collocation or the numerical relation to area occupied is an important element and influence. The consideration of this imaginary case and its difference from ordinary practice in the most open of woods, may also stimulate reflection on the causes and reasons of customary procedure.

Why is it that in every plantation a great many more plants are planted than can ever possibly come to maturity? We shall be told, probably, that the extra plants are put there for the purpose of nursing those which are to form the permanent crop. This explanation, although it makes use of a figurative expression a little wanting perhaps in definiteness, may yet be accepted as a correct and comprehensible answer. It is not, however, by any means the whole answer or explanation. The essential reason why we plant a great many more trees than can survive is because the forest soil requires to be sheltered from sun, wind, and weather. Unless it be so sheltered and preserved, even the first single crop of timber would fall off in its later growth, and still more does the protection of the soil appear necessary when we consider that it has to bear many future wood crops in succession, although it can very seldom enjoy the benefit of the spade, fork, or hoe, and although the addition of carried manure it never at any time receives.

In order that the soil may be fertile and active for the production of wood, it must be porous, friable, and of rather loose consistency, so as to permit of aeration and the penetration of carbonic acid gas and the other gases. This physical condition of the soil is promoted, and after lapse of long periods even produced, by close order of trees completely occupying and covering its area. What is perhaps equally worthy of our consideration is that when porosity and granulation of the soil is once accomplished, as it may be sometimes artificially at the time of planting, this physical condition and favourable consistency will be preserved and continued by the maintenance of close order. Close order of trees, with close and continuous leaf canopy, shades against the sun and prevents heavy showers from beating directly on to the ground, thus protecting it from two influences which together tend to cake it and harden it. Again, the many roots of the trees, including also the decaying roots of those which have been removed in the successive thinnings, help to swell and loosen the surface of the soil. Thus, close order of the trees comes to be recognised as the most effective agency which can practically be employed in the woods as a substitute for frequent spading or ploughing.

By close order it is intended to convey that the trees shall be as numerous on the area occupied as is consistent with the healthy development of the great majority of them, but more numerous than would be quite consistent with the continued existence for five or ten years longer of the whole of them.[1]

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[1] The following figures may perhaps give a more tangible idea of what constitutes close order. The example refers, however, only to the spruce fir. It has been extracted and reduced to English measure from a table compiled by

It is reached first of all and necessarily by the young wood in the thicket. The thicket stage of young wood should never be disturbed nor avoided by thinning too early. The close order once established in the thicket should be maintained by moderation in the successive thinnings till the end or near the end of the cycle. Close order implies that the foliage or spray of neighbouring trees shall touch and intermingle. Thus close order is in nearly all instances necessarily accompanied by close leaf and canopy and shade. A distinction must, however, be made between close or complete canopy and dense canopy. This distinction depends on the species of tree and the character of its foliage. Dense leaf canopy is the most thoroughly efficient and satisfactory, such as is supplied by the foliage of the beech and several species of fir.

There is safety and economy in close order and canopy. It has already been considered that while we cannot afford the frequent hoeing or delving of the forest soil, close order and canopy help us out of the difficulty. Let us next consider another useful property of close canopy. It eradicates all herbage and weeds when it is thoroughly dense and efficient, and when the canopy is only moderately complete it keeps the grass within bounds and does not allow a rank growth to overrun the ground. First, in the thicket stage the dense shade destroys all grass and heather, and afterwards the forester, by avoiding too great severity in his thinnings, may keep them from again overrunning the ground. We cannot desire to take an annual crop of coarse hay off the forest soil. Why then allow the luxuriant growth of grass which is to be seen in many

the Royal Wurtemburg Station for Forestry Investigations from numerous actual measurements and assessments:—

Age. Years.	Number of trees per acre.	Average height. Feet.	Age. Years.	Number of trees per acre.	Average height. Feet.
5	—	2	65	445	83
10	—	5	70	390	89
15	—	10	75	350	93
20	2590	17	80	320	97
25	2140	24	85	290	102
30	1700	32	90	270	105
35	1340	40	95	250	109
40	1060	48	100	240	112
45	860	55	105	233	115
50	720	63	110	228	118
55	610	70	115	227	120
60	515	77	120	226	121

In the case of a *plantation*—for the first three ages left blank above we might interpolate against each the number 4840 as the number of trees per acre. There would be no regular thinning till the twentieth year. In or about that year the thicket stage would be terminated by the first ordinary thinning. It should be mentioned that these extracts refer to the first class or quality of forest soil suitable for the spruce. On soil of the second class the trees would be more numerous per acre, and on the third class still more numerous, but inferior in height and cubic contents.

plantations, robbing the wood of some of its nourishment, and impoverishing the soil in respect of its available mineral ingredients? Seeing that we cannot afford to transport manure into the woods, we must by all means husband the mineral strength of the ground, depriving it only of the modest requisitions of the wood crop. These requisitions do not amount to much, and being spread over eighty or one hundred years, the ground easily satisfies them. Nevertheless, frugality has to be exercised with regard to the gradually dissolving mineral ingredients of the soil, confining the enjoyment of them as much as possible to the wood crop. This precaution is provided for by close canopy destroying all herbage and weeds.

There are, however, several species of tree which form unsatisfactory canopy, and which in advanced stages of growth refuse to thrive in very close order, or to keep the herbage in check. The larch, for instance, when it is cultivated on level ground away from its native mountain slopes, refuses to preserve close order as it advances in years. Here and in other similar cases resort must be had to a device in harmony with the general principle of shading and preserving the soil. Since the larches refuse to form a sufficient leaf canopy overhead, they must be assisted by a second canopy—or we may call it at first perhaps a carpet—underneath. That is to say, some other wood, such as silver fir or beech, should be planted beneath the larches at some time between their twentieth and fortieth year.

A similar difficulty confronts us in the case of most of the European deciduous woods with broad leaf. To secure dense and satisfactory canopy in their case and the full advantages of close order, they almost all require to be raised in admixture with a plentiful quantity of beech, unless the same device of underplanting, as in the case of the larch, be employed. Beech treated with moderate thinnings will provide itself with perfectly straight and branchless shafts even up to 70 feet high and more out of a total height of over 105 feet. A minority of oaks scattered here and there singly or in clumps amongst beech, measures being taken to keep the latter in due subordination, will be trained almost to the same degree. The beech is invaluable for training up the more valuable hardwoods and for enriching and preserving the soil. It may be necessary to enlarge the space allotted in our woods to this useful and stately tree for the sake of protecting the soil and rendering a permanent wood culture possible. There would be the less difficulty in giving the beech more room if the report should be verified, that creosoted beech forms excellent railway sleepers.

To discuss all the advantages of close order and canopy would take a great deal of space and patience; but there is one advantage which cannot be omitted without detriment to the thorough understanding of the question. This is, that close order and close leaf canopy contribute and retain a greater proportion of fallen leaves and litter to form a natural manure—the only one at present possible—for the woods, and also so moderate the process of their decay as to produce the greatest quantity of powdery black leaf-mould. This powdered humus is added to the surface, enhancing the porosity of the soil. Close canopy thus actively both manures and loosens forest land. It has an appreciable active effect in addition to the passive saving of minerals and preservation of porosity.

Finally, close canopy, while it prevents heavy showers from beating directly on the ground and washing it severely, also prevents the evaporation of moisture from the ground. It prevents the sun from drying up the ground; it stores up the accumulated moisture of the rainy weather to be of use to the trees in the hot season of active vegetation and in seasons of drought. This is equivalent to providing for the watering of the forest soil in the time of its greatest need.

Forestry is not like farming or gardening. It can do comparatively very little in the way of calling to its assistance labour and extraneous resources. Even if it could be afforded, labour could do very little to accelerate or increase the growth of wood; and labour freely expended on the woods would be by no means certain of ensuring a commensurate return. It is therefore a pervading principle of Forestry to let nature do as much of the work as she can be induced or guided to do. In this sense it will be found that close leaf canopy has claims on our attention which cannot be overlooked. Close order of trees protects the chemical and physical condition of the ground, and it is, as we have seen, an economical substitute for the four important cultural operations—manuring, delving, weeding, and watering—to the great and enduring advantage of the forest soil. S. G.

LARCH, NATIVE AND FOREIGN.

THE question as to the points of distinction, if any exist, between the so-called native and foreign larch is often a troublesome one to answer. I have met with those who declare they could tell which was which in any set of samples of say one-year seedlings that might be submitted to them. But I have always had a suspicion that in the absence of actual information as to the source whence the different samples were derived, and the circumstances of soil and culture under which they were produced, that such decisions were more remarkable for their daring than their trustworthiness. There might be one sample of greater luxuriance of growth, and consequently broader and longer foliage; but when asked whether this distinction might not be the result of the soil and the mode of cultivation, the reply of these knowing ones has always been such as to confirm the lurking suspicion that they knew nothing whatever about the matter. The larch as we know it and grow it is in fact only one species. There are, it is true, varieties, as there must be in the progeny of every widely distributed tree, especially in such as have come into cultivation so extensively as this valuable timber tree. But I place no faith in the pretended ability of many to distinguish between the seedlings raised from *native* saved seeds and the seedlings raised from imported seeds, except they also know their origin and the circumstances under which they have been grown. The fact that plants from both sources, when planted in the forest side by side, or even in groups apart, but in the same or similar conditions of climate and soil, lose all individuality, is sufficient proof of the baselessness of the pretension to be able to discern between the one and the other in the seedling state.

The only distinction of any practical importance between seedling foreign and native larch is that of individual precocity of growth in spring. The former beats the latter a few days in the start or first response to the increasing warmth of the season. Every one conversant with the rearing of larch in nurseries is aware of this peculiarity, and have often to lament its consequences. A few days seem but a small matter in the period of the starting of the growth of an admittedly hardy tree; but it not unfrequently means all the difference between success and failure. Our British climate is proverbially uncertain, and the weather of our springs is the most fickle of all. From March till the middle or end of May, genial warmth, mild showers, frost, snow, hail, and destructive east winds, the one succeeding the other within the limits of twenty-four hours, are the characteristics of our general spring weather. Our native plants and those exotics, such as the larch, that are acclimatized are constitutionally adapted to these changes. They start later and move more slowly than many trees which endure in their native habitats a much lower mean temperature, but which are habituated to a sharper definition of the seasons. In the Tyrol and the Swiss Alps, whence we procure the bulk of our imported larch seed, autumn and winter are not blended together to form the climate of spring as they are in the average spring of the British Islands. In these continental homes of the larch, the tree, once it is excited into growth, rarely receives any check, because warmth increases steadily in the ratio of the advancing season. Year after year this state of things recurs, and a constitutional tendency or habit is formed in the tree to respond to the first slight impulses of warmth in spring. This constitutional tendency is transmitted to the offspring; and when reared in our climate, it is exposed to degrees of warmth during March and April for short periods, it may be, but yet long enough to stir its more sensitive energy into activity, soon only to be checked or paralyzed by a period of comparatively extreme cold or actual frost. Seedlings from the native larch, or more properly from home-grown seed, have, on the other hand, inherited a less sensitive habit from their parents, as the result of their yearly experiences in our peculiar spring climate. They respond less quickly and progress in growth more slowly than the foreign seedlings, and the growth being more dense and compact, they suffer less from the vicissitudes of the weather. But they are not always exempt from the effects of frost in spring any more than the foreign seedlings. Late frosts occur, as every nurseryman and forester of experience know to their cost and vexation, which make a clean sweep of the crops, be they foreign or native. The foreign larch, it may be further remarked, very soon becomes adapted to the peculiarities of our climate. It is only in the first few years of its existence here that it suffers more than the native, showing that it is only a little constitutional adaptability that is required, and which is easily acquired, to obliterate the only difference between it and the native. A. X. E.

INDIAN FORESTRY REPORTS.

THE progress reports of Forestry Administration in the Punjab and Central Provinces and the Hyderabad Assigned Districts have just been issued by the Government of India for the official year 1884–85.

In the Report of the Punjab Forests it is stated that the total area of the reserves comprises 1391 square miles. No increase has been made in the area of the Reserve Forests during the year, but it is in contemplation to make an addition of some 45 square miles at an early date. The Report deals with the subject of Forest Settlement in the Punjab very fully, showing what has been accomplished during the year, the result being the conclusion that the difficulties are great and the progress necessarily slow and costly. On the other hand, the progress made in the work of demarcation of boundaries has been satisfactory. The area of reserves surveyed up to date amounts to 740 square miles. Progress is also being made in the compilation of working plans. It is satisfactory to observe that there is a general decrease of offences connected with injury to forests by fire, which had recently been causing trouble and alarm, and suggestions are made to assist in protection from fire by a cheap system of fire lines, which have proved successful in preventing accidental fires from spreading in other districts. Referring to the modes of forest reproduction, the report approves of both natural and artificial methods being recognised and practised according to the varied conditions. In nearly all the hill divisions nurseries are established for the production and rearing of Deodar, but every means is also taken to foster natural production, by means of artificial culture. The quantity of timber received in depots during the year shows a decrease of 492,638 cubic feet, which is attributed to scanty floods on all the main rivers.

The Report of the Central Provinces deals with all the details of forest management already alluded to in the foregoing notice of the Punjab Report, and shows a substantial increase in the financial results.

In the Report of the Hyderabad Assigned Districts there is little of interest, except that the financial results are very satisfactory.

OAK COPPICE, ITS MANAGEMENT AND TREATMENT.

(*Contributed to the "Transactions of the Highland and Agricultural Society," by Andrew Gilchrist, Urie, Stonehaven.*)

A CONSIDERABLE extent of the woodlands of Scotland, particularly in the counties of Argyle, Dumbarton, Stirling, and Perth, being occupied with a crop of oak coppice, its treatment and management form a most important branch of the Forestry of Scotland. Oak coppice is grown for ornament and shelter, as well as profit, on many estates, and we have only to glance at it as it decks the shores of many of our most beautiful Scottish lakes, or contemplate it as it clothes the rugged slopes of some romantic mountain or deep glen, to realize how peculiarly appropriate it is, and how well adapted to contribute to the wild grandeur and natural scenery of these Highland situations. Even in the vicinity of a mansion-house there are many portions of ground, as, for example, on the sides of a drive, or in a belt on the outskirts of the lawn, where it may be desirable to have an extensive view, and at the same time concealment from the outside, where oak coppice, interspersed with a few standard trees, forms the most suitable crop. When these places are divided into nearly equal portions, and managed in a systematic manner, part being cut over every year or so according to the extent, they form a very useful and, in some situations, a most ornamental screen to those parts where tall-growing trees might be objectionable.

Whatever be the extent of coppice plantations on an estate, they should be apportioned and treated in succession. If there is sufficient acreage to allow a portion to be cut over every season successively, it is beyond all question the most judicious and profitable plan; this method enables the forester and proprietor to have an almost accurate estimate of the expense that is to be annually incurred in the rearing and cutting over of these, and keeps up an almost regular annual income from the plantations. If, for example, an enclosure of about 100 acres is divided into, say, four portions of about equal size,—according to soil and other local peculiarities,—and one of these cut over every five years, it keeps up the ornamental appearance of the district much better than if the whole plantation were cut over at one time. Another important advantage, especially in high-lying and exposed situations, is, that it tends to keep up the shelter that stock and crops derive from the proximity of plantations. The preservation of shelter should always form a primary consideration in determining the extent that is to be cut over in one season.

In very exposed situations, where shelter is really indispensable to the increased fertility and proper cultivation of the soil, as also to the health of the stock, it is almost impossible to ever-estimate the bad effects that follow its sudden removal. When the productiveness of the soil has been increased by the influence of plantations, it is of paramount importance that it should be continued; when it is injudiciously and suddenly removed, the soil not only decreases in productiveness, but in some instances we have seen it incline to return to its pristine sterility. Wherever shelter is a primary object, it should be the aim of the forester, in apportioning and arranging the time of cutting over the plantation, to preserve as far as possible a certain amount of shelter to the district. This and the proportion of any plantation that is to be cut over in one season must be determined by a careful study of the peculiarities of the situation, nature of the soil, etc.

TIME FOR CUTTING.—No absolute law can be laid down regarding the exact age at which oak coppice should be cut over; this can only be properly determined by the appearance of the crop, which to a considerable extent depends on the soil, situation, exposure, and method of rearing. It is from the appearance and condition of the bark that the most profitable time to cut must be determined. On damp soils the bark is frequently covered with mosses and lichens; it becomes rough in the exterior at a much earlier age. On such inhospitable soils we have seen instances where it would have been a decided advantage to the proprietor to have it cut over at fifteen years instead of leaving it for twenty; generally it should be cut over as soon as the annual growths begin to show signs of decreasing in vigour; it has certainly been left too long if the shoots have begun to dwindle to a dwarfish curled spray. When they are not cut over till this stunted state of growth has taken place, the value of the bark will be considerably lessened, as there will be a deficiency of circulating sap. The *liber* or inner bark of these stunted trees is thin, and contains but little tannic acid; it takes a greater quantity to make a ton, and a limited supply of ascending sap makes its removal difficult and expensive. The rate of growth on poor soils and exposed situations is at best generally slow, and long exposure impairs the vital energies of the tree, gradually causing it to become stunted and hide-bound; consequently it is also most profitable to cut over these early.

TIME FOR BARKING.—On suitable soils the bark is generally at its best after twenty years' growth. At this period, if the trees are in vigorous growth, the bark contains a greater proportion of tannic acid than at any other time. The bark of old trees of slow and impaired growth is generally thick in the cuticle (or corky bark), consequently it is of less value to the tanner; but even old trees, that have but a thin exterior bark and a greater proportion of cellular matter, are often deficient in circulating sap; therefore there is but a small proportion of tannic acid found in the bark. Generally speaking, the best bark is obtained from trees that are in a healthy growing condition, which not only have a large supply of ascending sap, but a greater thickness of *liber* to retain the sap as it ascends. It is during the ascent of the sap before the leaves have expanded that most tannic acid is present. After the leaves have fully expanded, the quality of the bark is not nearly so good. When the ascending sap reaches the fully-expanded leaves, exposure to the atmosphere causes it to be carbonized, and the cambium as it descends gives the inner layers of the bark a brown colour. Bark peeled after this takes place is comparatively deficient in astringent matter, and it takes a greater bulk of it to make a ton; and another disadvantage is, that the late cut stools send up much weaker shoots than those that are cut in the early part of the season.

METHOD OF CUTTING.—After determining the most suitable time at which the coppice is to be cut, the first thing to be done is to go over the plantation and select a few of the best-looking and most tree-like shoots, and mark them with paint, to be left at intervals over the whole of the ground; these should not exceed twenty to the acre, and even this number should be cut over with the next crop, and not be allowed to grow till they cover a large space of ground, as they through time overshadow the coppice shoots, and cause some of the stools to die out.

Where ornament is an important consideration, it is a common practice to leave a considerable number of old standards at equal distances over the ground; still, though this is desirable for the sake of appearance, it is often carried too far for the profitable growth of coppice. Large numbers of old branchy wide-spreading trees will prove hurtful, and through time exterminate the coppice stools. Wherever a number of standards must be interspersed with coppice, they should be brought up under a judicious system of foreshortening, and the strongest and most widespread of the side-branches restrained and kept from overshadowing the coppice. Before commencing to cut over the shoots, the proper method is to send a person with a handbill, peeling iron, and a mell, and instruct him in the first place to press down with his foot all the soil round the collar of the stool (or shoots), and then with the handbill cut through the bark to the wood, making a ring all round the base of the stem of each shoot, not more than 2 inches from the surface of the ground; a similar ring is cut about 30 inches higher up on the boles, and the bark between the cuts is removed for the purpose of preventing it from being rudely torn from the stool during the process of cutting over the shoots. It also serves as a guide to those who cut over the shoots, causing them to cut so as to have a low stool. When the axe is used for cutting, the stools should be sloped slightly up from two sides, so as to leave them with a sufficient convexity to prevent water from standing on their surface. It is absolutely necessary that the axemen who are employed should be ambidexters, and most expert and neat-handed men; when men of this class are employed, they very often take an interest in the work, and exert themselves to try how low and neat they can make the stools. With good clean-cutting axemen the axe is better than the saw for all shoots below 6 inches in diameter.

On sloping ground the expert ambidexter, by standing on the high side, can cut over the shoot neatly with the slope of the ground, while those men who can only use the one hand always leave a rough surface on the stool, and the one side higher than the other. When the work is performed by these unpractised men, the stools are often too high above the surface of the ground, and the shoots that spring from these are never so strong as those that grow from low stools, where they are able to send out individual roots into the soil. When the cross-cut saw is to be used in cutting over strong shoots, in order to prevent the stool from being injured by the shoot falling, and tearing part of the outer wood, they should be laid in, and then neatly faced with the axe on that side on which the tree is intended to fall. As soon as the shoots are cut, the stools that have been sawn should be dressed with an adze, the outer edge being reduced to the level of the surface of the ground, so as to form a slight convexity to prevent water from standing on the stool. It is generally best to keep the most expert woodmen felling, and some less experienced, following with light axes, pruning the branches from the bole; and these are followed by others with handbills, who prune out all the branches to about an inch in diameter. This part of the work is light, and should be done in a most active and expert manner. The operator, as he prunes out the branches, should cut them off in handy lengths of about 3 feet, and leave them collected in heaps ready to be carried by another set of men to the peelers. During the time of pruning, the men should be instructed to preserve as many forked branches similar to Y as possible; these should be from 3½ feet to 4 feet long, and are required for the erection of the drying ranges. The peelers are arranged on the sides of a plantation road or other suitable place where the work can be carried on without injuring the stools, and at the same time not at too great a distance from the cutters, and also convenient for the removal of the wood and bark. The whole of the wood should be carried to these suitable places for the peelers.

STRIPPING THE BARK.—The peelers are each provided with a peeling-iron and mell, and those who are to peel the smaller wood have a smooth stone about 10 inches square by 6 inches deep. A few of the best peelers are started to peel the boles and strongest pieces of wood; the bark on each bole is first cut into about 3-feet lengths with a handbill, and then taken off with a peeling iron, great care being taken to keep the bark in as large pieces as possible. It greatly facilitates the work when each pair of these peelers is provided with one or two of what is technically called a *horse;* on these they lift one or both ends, and are thus the better enabled to take off the bark speedily and in large pieces. As soon as the bark is stripped, it should be laid in heaps with the fleshy side down, ready to be carried to the drying ranges. Those who peel the smaller wood generally sit on the ground with the wood to be peeled on their left side, and they start the bark by beating the piece of wood over the stone with the mell. When the bark is in good condition for peeling, a very moderate beating generally causes it to open from the wood, when it is easily taken off in one piece with the hand without the aid of the peeling iron; but it sometimes happens that the iron is required, especially with the stronger branches. Severe beating with the mell should always be avoided, as it injures the bark and lessens its value to a considerable extent, causing it to contract mould, and making it more difficult to dry. When the bark is stripped off it is laid on two pieces of wood on the right-hand side of the peeler, and thus as it is taken off it is built up nearly into a bundle, keeping the white side of each piece undermost. The various pieces of bark composing a bundle vary considerably in length ; but they should be all stretched out to their full length, and any very short pieces laid in the middle, while attention is paid to keep one end of the bundle neat and even. The bark that composes the bundle is not compressed together, but all the pieces are laid in a careful manner, so that they can be readily lifted in a rope and carried to the ranges, and laid on these in a neat and even way, keeping the even ends of the bundles all on one side of the range. This neat and careful method of laying the bark in bundles as it is stripped off is easily done, and saves a great deal of sorting and gathering, as the bark is readily laid out on the ranges without the bundle being tossed and ravelled ; indeed, it is an advantage to the handling of the bark all through the time of drying and working.

Drying the Bark.—The ranges should be erected on the most dry and airy situation that can be got in the wood. The best way is to drive in two rows of forked sticks into the ground, about 4 feet apart, opposite to each other, and about 30 inches between the rows, and leave them about 3 feet high above the ground, laying on other pieces of wood, and making the range in the form generally adopted. The ranges are sometimes put up with a considerable hang, so that the one side of the bark is higher than the other ; this practice cannot be recommended, as it allows the water that falls on the high side to run inwards and pass down through among the bark to the lower side. A very little hang on the range is all that is necessary (at most not more than 2 inches), as when the bark is laid on to the range, with the even ends of the bundles all to one side, it gives a considerable amount of slope to the bark sufficient to carry off the water without risk of it being admitted at the high ends of the bark.

The erection of the ranges and laying out of the bark should be entrusted to a careful and experienced man. A person should either be kept regularly carrying the bark to the ranges, or each peeler caused to carry his own bark every two-and-a-half hours ; when this system of going to work is adopted, the superintendent should be present at the ranges when the bark is brought in, to see the quantity and quality that each peeler brings in, and at once check every appearance of carelessness.

When laying the bark on to the ranges, the outside should always be kept uppermost, and the bark laid not more than 18 inches deep, and the whole covered over with the largest and most flat pieces of bark, laid on in a way that will carry off the water from the range; in fact, the most particular attention should at all times be paid to prevent it from being even slightly saturated from water. "In the presence of moisture, tannic acid exposed to atmospheric agency absorbs oxygen, and is converted into gallic aid, a compound which is of no value to the tanner;" neither should the inner side be exposed to the influence of the sun, as it evaporates the juices that are most useful to the tanner. When the bark has been on the ranges for three or four days, it should be turned, or rather shifted, so as to keep it in an open state; this permits the air to circulate freely among it, and prevents it from becoming mouldy. Properly-cured bark breaks freely, and has a light cream colour, but when it has been damaged by exposure to the weather it is brown-coloured. This at once indicates that part of the astringent matter has been extracted by exposure to unfavourable influences during the drying process. It generally takes from two to three weeks to dry oak bark, but with favourable weather we have had it properly cured in eight days. As soon as it is considered to be sufficiently dried, it should be carted into a shed or built into an oblong stack, where it is chopped into pieces about 2 inches square, and put into bags ready for removal to the tanner. When it is built into a stack, it should be thatched, and a large tarpauling erected to keep off rain during the time it is being chopped and bagged.

Ranges are very often carelessly put up. We have seen instances where the one end of the range rested on the ground, and the other not more than 2 feet high. It is obvious that bark laid on in this careless way cannot dry so fast as it does when on properly-erected ranges; and besides, when the ranges are put up in this sloping fashion, the water naturally inclines to run down among the bark, thus causing a considerable waste of tannic acid. The bark being laid so near the surface of the ground, the drying winds do not circulate so freely through among it; consequently, in the best of seasons it takes longer to dry, and the quality is very often much inferior. Surely, if it is worth while to strip the bark, it ought to be carefully and properly cured. Where there is annually a considerable quantity of oak bark to be dried, it would pay to keep portable sheds with shelves in them for drying the bark. With these, an improved quality of bark would doubtless be produced.

When the bark on the shoots is partially covered with a growth of mosses, it should be scraped off with an iron scraper previously to the bark being taken from the tree, as when this is not done it deteriorates the quality of the bark considerably.

During the progress of the work the superintendent should see that everything is going on with the greatest possible activity and regularity. The peelers should not be allowed to lag behind the cutters; on the contrary, let them be so close up to them that while they may not be out of wood, there may at the same time be but a small quantity of unpeeled wood left over-night, as it gets much stiffer to peel the longer it lies after it is cut. The state of the weather affects the progress of the work. A genial shower after cold weather makes the stripping much easier, and gives a better quality of bark, while continued drought has the opposite effect. There is a great deal connected with the stripping and drying of bark that can only be learned from having participated in the work. When the hands have been hardened with the use of the various tools, it becomes a much easier matter for a man to lead on others with expedition. The peeling is generally performed by women, and, along with the drying, costs 35s. to 50s. per ton, according to the size of the trees, rate of wages, and other circumstances.

As the cutting and peeling advances, there should be a party following burning up the brushwood, so that the growth of the young shoots may not be obstructed in any way; it is very bad management to delay this and the collecting of the wood till after the peeling is finished. The young crop is sure to sustain permanent injury if these operations are delayed till the shoots have begun to grow.

In another paper will be given the mode of planting, thinning, etc.

SIDERETIZING, OR IMPREGNATING WITH IRON.

IN the *Journal of the Georlitz Exhibition* is published a new process, by a chemist, Dr. Hermann Hager, for the better preservation of the various woods mostly used for posts, and cellar joists, and such purposes, including also the softer woods; and it seems to be at least worth testing by further experiments. This process, called by its inventor "Sideretizing," consists in thoroughly soaking the wood in a hot solution of salts of iron, and then, after it has been dried, placing it in a hot bath of *Wasserglas* (a sort of glass containing a larger proportion of potash than of sand). During this bath the water-glass solution forms with the salts of iron a perfectly insoluble silicate of iron in the outer layers of the wood, which has no effect on the smell or colour of the wood. This coating of silicate of iron surrounds, with a defensive armour against all outward influences, the inner layers, which are permeated by iron salts, and thus fortified for a long time to come. This process has been already applied in the Impregnating Works of C. Amendt at Oppenheim on the Rhine, and it is no doubt a very effectual one; but whether it is not rather complicated and expensive remains to be proved by further experiments before it can be employed on a larger scale.—*Centralblatt für das gesammte Forstwesen.*

COUNT DE CARS' BOOK; OR, A "CRITICISM" CRITICISED.

CAPTAIN HENRY ROGERS, R.N., criticising Count de Cars' method of pruning, points out what appear to him as some deficiencies in his method. In criticising another man's opinions, it is well to remember that whatever may be our ideal of a perfect method, it is not possible to reach that Utopia of perfection which any individual mind can without any strain picture, but which is entirely without substance in the real world of facts accomplished or to accomplish.

There are defects and failures in all systems, however carefully elaborated; while the defects of any system of procedure as applied in the practice of Forestry, will always be in ratio to the *modus operandi* and the time of making the operations. Pruning does not consist in one only performance, done at any time and in any way after the tree is old, without anterior or ulterior regard to its disposition. Pruning consists in a long series of cautious operations, beginning in the early-growth stages of the tree's life, and is continued on through many years of its later life, and may in fact be continued throughout its complete existence. The difference between pruning and pruning is immense, and in that is contained absolutely the success or failure of this the most delicate branch of Forestry. Some say, Leave all pruning and thinning to nature. I have no belief in nature's procedure in that. No doubt nature will perform in her own time and way; but how will nature do that? Will it not be by wholesale destruction or universal suicide of herself? The whole secret of successful pruning is to be found in the time and manner of doing the work. It is said that "a little knowledge is dangerous;" and so it is very dangerous, especially in the art and practice of arboriculture, and the novice should only be entrusted with its most simple developments.

Now to notice some of the several points raised by Captain Rogers in his "Criticism." Most foresters will agree with the objection of "Rustic" to nail wood or metal on cavities in growing trees. Still sometimes, and in some places, a tree is more esteemed for its ancestral value and its position in the landscape, than for its highest pecuniary value; that is, its standing value as an historical object is more precious and dear to its owner than its greatest timber value as a prostrate log. No device in such a case that will tend to prevent decay ought to be despised.

Count de Cars says that "the secret of obtaining complete cure in all operations requiring the removal of a branch, either living or dead, consists in cutting close to and perfectly even with the trunk," and so on.

"It is (remarks Captain Rogers) a great fallacy to suppose that the wound, caused by cutting off a branch even with the trunk, is ever healed over. The dead surface is only covered over with living wood."

True, but only so when the branch is previously dead, and so dead that the cutting off of it level to the trunk does not reach the quickwood of the trunk. Then the dead surface can only be covered with living wood. But even that is better than a defunct branch slowly falling to dust from the tree of its own accord, and will do something to conserve the life of the tree. Now if the branch was living instead of dead when cut off, the application of "tar" to the wound will preserve the wood until the process of healing is complete, and the wood of the wound will be as sound and good as any other part of the trunk. Where Captain Rogers' criticism appears weak is because he looks upon all branches as being dead before they are cut from the tree—at least he only speaks of dead surfaces; so that we are forced to conclude that he appears to have a settled conviction that all branches are dead before they are removed. Well, if all branches were dead before they are cut from the tree, they ought not to be so (this is said of hardwood trees), since, if we ask ourselves this simple question, Why do branches die? among many answers which might be given, this main reason is clear: They die for lack of light and air, which is a result of injudicious treatment and a want of proper sympathy in man with the requirements of the tree. The more we look into this work of pruning, the more evident is it that it is an operation which should be done early, done regularly, and continued to finality. Count de Cars says: "The principle being established that large wounds can be made without injury to the tree," etc. Captain Rogers demurs to that, and so do I, but not for the same reason. I demur to it because I think "the principle cannot be established," that large wounds can be inflicted without more or less injury to the tree. Captain Rogers demurs to it because "timber merchants do not think so, and would rather see a decayed stump projecting from the trunk of an oak than a scar showing that a large wound had been healed over."

The preference of the timber merchant is obvious, since he is in no doubt about the value of the timber, as he sees a visible defect in the decayed stump; and if he is a buyer, he does not fail to point out the defect to the owner, and therefore trys to buy the tree as inferior and worthless timber.

"The diagram clearly shows that cutting a branch off in line with the trunk, carries the defect in the timber well into the heart of the tree."

The cutting away of a branch in line with the trunk does not carry a defect into the timber unless the branch was before unsound, in which case the defect is not the result of pruning, but is due to the branch being dead aforetime.

"There is an instance of an oak tree having seven wounds made on its trunk from ten to twenty inches wide. If any two of these, averaging fifteen inches wide, were at right angles to each other, they would spoil every plank in the tree."

That would depend altogether on how the tree was planked, and on what part of the tree the wound was placed. But apart from the consideration whether such a method of pruning would or would not render the timber useless, no sane person, possessed of even the crudest notions of pruning, would ever think of removing two such branches from a tree at once. Why, two such branches cut away together, would represent a surface-wound of thirty inches, which, even upon a very huge trunk, could not be other than most prejudicial, if not forcing untimely death on the most vigorous subject.

Captain Rogers says: "If a branch dies through slow decay, the new growth around the dead stump closes in gradually and carries the defect out into the sap of the timber."

Now the evil effect of such a method is capitally illustrated in the diagram on p. 406 of the same volume from which Captain Rogers quotes so freely. The bad consequence of such indifferent methods is so well depicted there that no other condemnation of it is necessary.

Anything conducive to the greatest production of excellent mercantile timber cannot be excluded from forest management. Pruning is so; nay, more, it is an absolute necessity of that.

Count de Cars remarks that "the future value of a tree depends on the manner in which the operation is performed; and the person to whom this work is entrusted should fully understand its importance." With that I quite agree. And I would add that the future value of the tree depends as much upon the time at which the operation is done as upon the manner in which it is done. Great hurt may come to the tree through want of timely pruning. Pruning is a most elaborate and a critical operation, requiring both skill and care.

Perhaps it is not possible to concur in all that Count de Cars says on pruning; nevertheless, on the whole his "Book" is an excellent "work" and guide on the subject, deserving the very best attention of all foresters, and worthy the study of all students of Forestry seeking to widen their knowledge in one of the most delicate operations of practical Forestry.

James Farquharson,
Forester, Glendye.

THE ELECTRIC TREE OF NEW GUINEA.

THE following is going the round of the papers at present, and we give it for what it is worth, merely remarking that it is too much on a par with many other unrealized wonders of New Guinea for us to accept without reserve. It has a Munchawsenish smack with it, and we shall wait with patience further developments regarding this to our mind somewhat uncanny tree. The fact that "Dr. Kummel is much puzzled to account for the existence of this singular tree by any process of natural selection," is very interesting as reflecting on the doctor's facility for being puzzled. One would naturally think that his own experience with a little bit of "core," would have suggested to him the process by which his newly discovered tree has been selected by nature as the fittest in the region it occupies. The tree that could send a German doctor rolling and yelling on the ground, and cause him to lose his spectacles, appears to us to be eminently capable of taking care of itself, and of holding its own in the struggle for existence:—

"One of the German expeditions to New Guinea has just made a startling discovery. It has, of course, been perfectly well known, and is indeed one of the great principles of modern science, that force, or energy, is not only indestructible, but transformable, as, for instance, the heat energy of steam is transformed into the energy of visible motion by the steam engine, and that again into the form of energy which we call electricity, by the dynamo. So, again, it is of course familiar that the peculiar force, whatever it is, which we call vital is partly transformed into weak electric currents along the nerves of men and other animals, an extreme instance occurring in the well-known electric eel which gives a really powerful discharge of electricity. Now, hitherto in plant-life nothing of the sort, however possible, has been proved to exist, and the New Guinea discovery is neither more nor less than a gigantic vegetable gymnotus. The scientific interest of the find is immense, and not less, probably, its future practical bearing on the lives of our descendants. The electric eel could scarcely be used as a regular source of electric currents, but the *Elsassia electrica,* as Dr. Kummel has patriotically named it, can, to all appearance, be readily acclimatized and cultivated, and, if not overdrawn on, will give, if one may use the expression, a steady crop of energy available for all the multitudinous uses for which modern civilization now uses the dynamo or the battery. It is true that the current given by one tree is, though considerable in quantity, of much lower intensity than is wanted for many purposes ; but even if it is found that this defect cannot be remedied by coupling up a number of trees in series without damaging them, science has methods of transforming, with little loss, larger weak currents into smaller strong ones, and there need be no difficulty on this score. The outlook is immense: parks which will form a pleasant recreation-ground to the citizens will light our cities almost free of cost or care ; our gardens will themselves illuminate the villages of their owners, whilst the very hedgerow trees on our farms will supply the power for agricultural operations in the fields which they surround. I purposely refrain from the greater question of the application of electricity from this source to the general supersession of steam and other motors, but that it will come I have little doubt. However, I have said enough both on the theory and the prospects of the discovery, and cannot now do better than relate in his own words the account given me by Lieutenant von Immer Gassende, the fortunate discoverer, who is now on his way to Sydney, where he catches the French mail steamer, the *Salazie,* on the 6th October and proceeds to Europe. The Lieutenant, though much pulled down by the dangerous fever he has had, and which is indeed the cause of his return home, is anxious to be again in New Guinea, and to pursue those explorations which have been already so fruitful in result. He is a fine type of the German gentleman and sailor. He said: ‘It is unnecessary to trouble you with many details of our journey. Dr. Kummel and I, with some half-a-dozen men, left the ship at anchor in a small bay to the east of Cape Della Torre, and at once commenced working our way, as nearly due south as we could manage, over the low jungle-covered range which here skirts the coast. We saw for the first two days a few natives of the type prevalent in this part of Papua, with small patches of bananas and other cultivated ground ; we were not, however, molested by them, and farther on the country seemed absolutely without inhabitants. When we had got some 100 miles inland, a journey which took no less than twelve days' hard work, and had reached an elevation of about 5000 feet, being, in fact, on one of the northern spurs of the great central range, we encamped for the night in a more open country than we had hitherto seen. Our way in the morning was on an ever-ascending slope through park-like scenery, not only beautiful in itself, but a very refreshing change from our previous experiences. Towards noon I stopped under a large tree which seemed to particularly attract the attention of Kummel, who had been finding all kinds of novelties the whole morning, to take the exact bearings of a high peak which was visible through an opening in front of us. To my surprise, the compass seemed utterly drunk, varying in all directions in the most capricious manner at each movement I took. I called Kummel's attention to this, and he said jokingly that we must have arrived at Sinbad's loadstone rock. I tried a variety of experiments, and found that, on walking into the open, the disturbances became feebler, but did not entirely cease for some distance. Whilst we were discussing the matter, one of the men, who carried a heavy cutlass or *machete* for clearing the path, struck one of a number of peculiar buttresses which ran up the outside of the tree, splitting off a large slice, and severing a curious-looking black core some half an inch thick, which formed the centre. Kummel, in his scientific curiosity, ran up, placed his hands on the two ends of the core to look at it more closely, and instantly, to my utter astonishment, gave a yell and rolled head over heels, getting up without his spectacles, and stammering to me that he had had a severe electric shock. One of the men was induced to repeat the experiment with similar results. I had no galvanometer, but improvised one with a length of copper wire, the centre of which I formed into an open spiral round my compass, and on inserting the ends of the wire into the opposite sides of the black matter, the needle was violently deflected, showing conclusively that a very considerable current was passing. Every branch and every twig of the tree, which I can assure you we treated with much respect, presented similar ridges and cores, with the addition of a thicker central one, and I quickly proved that the current circulated through the entire system. How it is kept up, no one can at present tell; but there it is. I am not able to say what the intensity or the quantity of the current might have been, but it was enough to knock you down in a very unpleasant way. We made a lot of more experiments on the tree, and would have cut it down, but it seemed a dangerous job to undertake. We saw a great many more of the same kind farther on, quite a forest, in fact; but I was that night attacked with very severe fever, and, after stopping several days to rest, I found myself obliged to return to the ship, and was then invalided home as my only chance. Dr. Kummel has returned with instruments to take proper measurements of the current, and to satisfy himself as to a number of points. In the meantime, I take home a preliminary memoir, pieces of the wood and core, etc., and seeds which we were fortunate enough to obtain. I am sorry I cannot show you them, as they are in my boxes on the steamer. The chemist on board says the black substance is a very pure amorphous carbon, giving hardly a trace of ash. Dr. Kummel is much puzzled to account for the existence of this singular tree by any process of natural selection. He says he cannot see how the possession of this system of electric currents could have benefited it. It has certainly, however, cleared out nearly every other species of forest tree from its *habitat*. Yes, I sincerely hope *Elsassia electrica* will grow in other countries; it would be a great thing, would it not?' "

FERTILIZATION OF BRITISH ORCHIDS.

BY A. D. WEBSTER, F.B.S.E.

IN the whole vegetable kingdom there is perhaps no order of plants the structure of whose flowers is so anomalous as regards the relation borne to each other by the parts of reproduction as the Orchidaceæ. The necessity of insect agency in the fertilization of these plants, although long hidden in obscurity, is now well known, and the many wonderful and beautiful contrivances, as well as endless diversity of structure for the furtherance of this object, are so full of interest even to the general observer, that we may be excused for devoting, in conjunction with the preceding notes on our native orchids, a chapter to the subject. That cross-fertilization is beneficial to most orchids, indeed of the highest importance, may be inferred from the almost innumerable structures serving for this purpose which they present. Of the forty species of British orchids just described, all, with perhaps two exceptions—*Ophrys apifera* and *Neotinea* or *Orchis intacta*—are entirely dependent on insect agency for their fertilization and the perpetuation of their race; while three others—*Neottia nidus-avis, Epipactis latifolia*, and *Cephalanthera grandiflora*—although occasionally fertilized by insects, are also, though more or less in an incomplete manner, capable of self-fertilization, so that even if not visited by insects, a fair proportion of seed-bearing capsules are produced. As the method of fertilization by the removal of the pollinia by insects is much alike in all our native orchids, and also that to describe even one species of each genus would occupy more space than is at our disposal, we therefore purpose describing in as concise and plain a manner as possible the action of the organs of fertilization in our commonest native species, *Orchis mascula*, and at the same time briefly pointing out some of the differences which exist between it and other members of the family. The accompanying illustrations, without which we find it almost impossible to convey a clear description of the method of fertilization, have been kindly drawn and lent to me by E. C. Malan, M.A., F.L.S., of Cheam, and represent the various parts of the flowers of *O. mascula*, much enlarged. In Fig. 1 (where we are supposed to be looking direct into an open flower, the sepals and petals of which, except the labellum, have been removed), above the entrance to the nectary, which, as well as the ovarium, is here hidden from view, and immediately under the pouch - formed rostellum, will be seen the bi-lobed stigma, a surface so sticky as to retain whatever substance comes in contact with it, such as dust, small insects, or the properly-placed pollen. The anther, which consists of two separate cells, each containing a pollen mass, or pollinium, is situated above the rostellum. A pollen mass, or pollinium (Fig. 2), consists of a number of pollen grains fastened together by very elastic threads; a caudicle or footstalk; and a minute piece or disc of membrane with a ball of viscid matter on the under side. The pollinia have separate discs and are enclosed and kept moist by the rostellum.

How this somewhat complex mechanism acts (and Fig. 3 will serve to explain it), we will now describe in the words of Darwin: "Suppose an insect to alight on the labellum, which forms a good landing-place, and to push its head into the chamber (see side view Fig. 3, or front view Fig. 1), at the back of which lies the stigma, in order to reach with its proboscis the end of the nectary; or which does equally well to show the action, push very gently a sharply-pointed common pencil into the nectary. Owing to the pouch-formed rostellum projecting into the gangway of the nectary, it is scarcely possible that any object can be pushed into it without the rostellum being touched. The exterior membrane of the rostellum then ruptures in the proper lines, and the lip or pouch is easily depressed. When this is effected, one or both of the viscid balls will almost infallibly touch the intruding body. So viscid are the balls, that whatever they touch they firmly stick to. Moreover, the viscid matter has the peculiar chemical quality of setting, like a cement, hard and dry in a few minutes' time. As the anther cells are open

Fig. 1

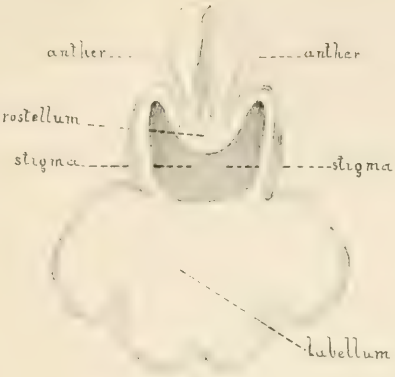


Fig. 2

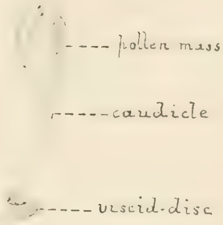


Fig. 3

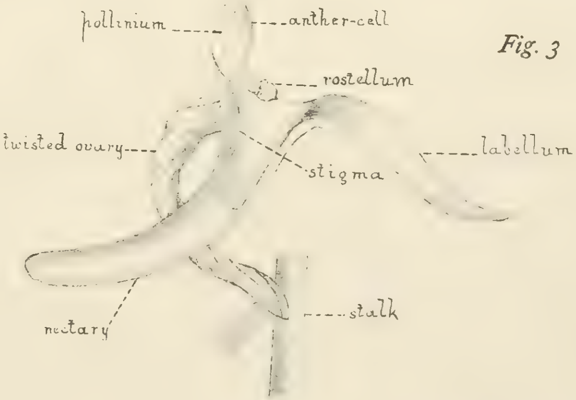


Fig. 4

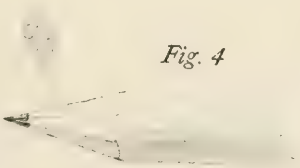


Fig. 5

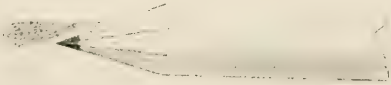
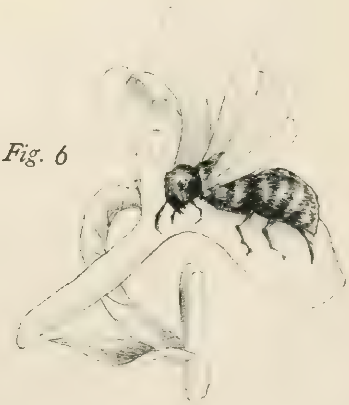


Fig. 6



McLagan & Cumming Edinr

in front when the insect withdraws its head, or when the pencil is withdrawn (Fig. 4), one pollinium or both will be withdrawn, firmly cemented to the object, projecting up like horns, as shown in Fig. 4. The firmness of the attachment of the cement is very necessary, for if the pollinia were to fall sideways or backwards, they could never fertilize the flower. From the position in which the two pollinia lie in their cells, they diverge a little when attached to any object. Now, suppose that the insect flies to another flower, or let us insert the pencil (Fig. 4) with the attached pollinium into the same or into another nectary; by looking at the diagram (Fig. 3) it will be evident that the firmly-attached pollinium will be simply pushed against or into its old position, namely, into the anther cell. How then can the flower be fertilized? This is effected by a beautiful contrivance; though the viscid surface remains immoveably affixed, the apparently insignificant and minute disc of membrane to which the caudicle adheres, is endowed with a remarkable power of contraction which causes the pollinium to sweep through an angle of about 90 degrees, always in one direction, viz. towards the apex of the proboscis or pencil, in the course of 30 seconds on an average. The position of the pollinium after the movement is shown in Fig. 5. After this movement, completed in an interval of time which would allow an insect to fly to another plant, it will be seen, by referring to the diagram (Fig. 3), that if the pencil be inserted into the nectary, the thick end of the pollinium now exactly strikes the stigmatic surface." The stigma itself, although very viscid, is not sufficiently so to pull the whole pollinium from the insect's head, and yet sufficiently viscid to break the elastic thread and retain a sufficient quantity of the pollen to fertilize the flower. One pollinium, therefore, suffices to fertilize several flowers. The pouch springs back after being depressed so as to keep the other pollinium (if only one has been removed) moist.

Little difference exists between the action of the organs of *O. mascula*, and those of *O. fusca*, *O. morio*, *O. maculata*, *O. latifolia*, *Ophrys aranifera*, *O. muscifera*, and *Herminium monorchis*. In *Orchis pyramidalis*, however, there is but one viscid disc which is saddle-shaped instead of, as in *O. mascula*, where there are two and rounded, and the pollinia after becoming attached to an object not only undergo the regular act of depression, but are previously, by the curling or clasping movement of the viscid disc, caused to diverge to the proper angle so as to strike the two lateral stigmas. *O. ustulata* and *O. hircina* resemble the latter species in the pollinia arising from a single disc, but only in *O. ustulata* does a slight divergence of the pollinia take place. In *O.* or *Neotinea intacta*, the pollen from being extremely incoherent falls spontaneously on the stigma, and the plant therefore produces a seed without insect aid. *Ophrys apifera* affords another example like the latter of self-fertilization, for the anther cells naturally open and the masses of pollen from their own weight fall down to the exact level of the stigmatic surface, and are there made to vibrate by the slightest breath of wind until the stigma is struck. It is curious that both these species, although constantly self-fertilized, still retain various structures which it is impossible to doubt are adapted for ensuring cross-fertilization, though they are now rarely or never brought into play. *Orchis* or *Gymnadenia conopsea* and the three species of the genus *Habenaria* have the viscid discs uncovered, but the pollinia go through the same act of depression as in a true *Orchis*, and the flowers are effectually fertilized by insects.

Cephalanthera grandiflora, although destitute of a rostellum, is constantly self-fertilized while in the bud state by the emitting of a multitude of tubes from the pollen grains. The structure and manner of fertilization in *Epipactis latifolia* and *E. palustris* is both complicated and beautiful.

The usual movement of depression in the pollinia of these two species does not take place, which may also be said of the genus *Spiranthes* and *Goodyera*. *Epipactis latifolia* is, however, frequently self-fertilized by the pollen falling spontaneously on the stigma. It is also a curious fact in connection with this plant, that the nectar should be so highly attractive to the red-tailed humble bee that cannot fertilize the flower, while to the wasp that can remove the pollen masses with ease, and thereby ensure cross-fertilization, it offers but little attraction, as is clearly shown by the almost total absence of its visits. (I have devoted a special paper to the fertilization of this *Epipactis* in the forthcoming *Transactions of the Botanical Society of Edinburgh.*)

In *Listera ovata* and *L. cordata*, the structure of whose flowers is essentially the same, as also indeed is that of *Neottia Nidus-avis* which has special adaptations for the fertilization of the plants, the action of the reproductive organs is both curious and instructive. As soon as the pollinia have become attached to an insect's forehead, the rostellum suddenly curves downwards so as to project at right angles over the stigma, thus protecting it from impregnation at an early age, and also to a greater or less extent preventing self-fertilization. In the course of a day, however, the rostellum not only recovers its original position, but stands upright, leaving the stigmatic surface perfectly free for pollen to be left on it by the first visiting insect. This is perhaps the most remarkable, as regards structure and adaptation of one part to another, of our native orchids, and also one that is readily examined by any person wishing to observe the method of fertilization.

Malaxis paludosa, with its upturned labellum, is freely fertilized by insects to which the flowers are highly attractive. The genus *Cypripedium*, of which we have but one British representative (*C. calceolus*), differs in a remarkable degree from any of those already described. In most British orchids, the stigma is viscid and more or less concave, and the grains of pollen united together in dry masses; whereas in *Cypripedium* the reverse of this is the case, the stigma being slightly convex and non-viscid, and the pollen grains coated by and immersed in viscid fluid. The labellum forms a large inflated pouch, the basal part of which is folded round the column so that its edges nearly meet along the dorsal surface, while the extremity is folded over, thus forming a sort of shoe, which suggested not only the English name of the genus—Lady's slipper—but also the Latin *Cypripedium* or Venus's slipper. The opening into the slipper from being partly closed by the stigma has a horse-shoe like form, and, owing to the edges of the labellum being much inflected, insects which have once entered the flower experience no little difficulty in escaping by the same way, but, unless in the case of very large insects, are compelled to crawl out by one of the two small orifices close to the anthers. In doing this, they inevitably come in contact with and carry off some of the glutinous pollen.

I have repeatedly caught small bees and placed them within the labellum of *Cypripedium calceolus* growing in my own garden, and thus clearly saw the whole method of fertilization. The bee, after repeated attempts to get out by the way it entered, which it could not owing to the edges of the labellum being inflected, at last forced its way out through one of the small openings close to the anthers. The inner surface of the labellum is, I have also noticed, covered with minute hairs which, from being recurved or inclined downwards from the large opening in the labellum, also prevent the insect that has once entered from escaping by the same orifice. Having had at various times most of the orchids just treated of under cultivation, ample opportunities were afforded me during leisure hours of investigating, by the help of Darwin's valuable work on that subject, their peculiar structure and methods of fertilization, an occupation which I must say has afforded me no small amount of pleasure as well as instruction.

PICEA PECTINATA.

(SILVER FIR.)

GLEANINGS from a paper contributed to the *Transactions of the Highland and Agricultural Society of Scotland,* 1885, by Mr. Robert Hutchison of Carlowrie:—

"The date of the introduction of the silver fir, now so familiar a denizen of the woodlands and plantations in almost every district of Scotland, is not precisely known. It cannot, however, be grouped amongst the pines now so commonly called 'the newer coniferæ,' which date their introduction not prior to 1830, for we are informed by Evelyn that two Spanish or silver firs were in his day growing in Harefield Park, Middlesex, which were planted there in 1603. Other early writers on trees mention silver firs as to be found in different localities about the same period, so that we may at all events quite safely assert that the tree was well known in this country in the seventeenth century, if not then actually grown extensively in plantations as a timber tree for profit.

"It appears to have early attracted favourable notice, and the desire for its more general diffusion throughout the country is evidenced by the fact that in 1797, the Society of Arts awarded their gold medal to Henry Vernon, Esq. of Hilton Park, Wolverhampton, for having planted 6000 plants of the silver fir. Compared with this desire for its more extended propagation throughout the country at that period, it is somewhat singular to find this tree in comparatively little favour with planters at the present day. Not that it has been supplanted in the estimation of arborists by any of the new-fangled introductions of recent times, many of which closely resemble it in habit and appearance, indeed so closely, that when they have attained the dimensions of many of our old examples of silver fir throughout the country, it will be very difficult by mere sight to distinguish between them; but probably, owing to its slow progress in growth during the first twenty years or thereby of its existence, the silver fir has never been so popularly and generally planted in Scotland as it might have been. This is, however, a very great mistake, for when once fairly established in suitable soil and locality, no other coniferous tree will make an equal amount of wood of mature and valuable description in the same time. In this respect Scots fir wood or spruce, or even larch of about thirty to forty years' growth, cannot in any degree be compared in point of quality and firmness of grain with the wood of silver fir of the same age.

"The silver fir delights in good soils, whether of a loamy or sandy nature, inclining to moist, and it prefers a high altitude with shelter; and in such situations we find some of the finest specimens recorded in Scotland. It is not, however, unsuited to lower situations, provided the subsoil be not water-logged; and it is found in some localities on the west coast of Scotland, of very large dimensions quite near the sea-level.

"When young, the silver fir is apt to lose its leading shoot from the effects of late spring frosts, and hence we find in almost every district where it is grown, double-headed trees, giving them the appearance when old of belonging to a species of which this was the natural habit of growth. Another peculiarity of growth in the silver fir frequently to be met with consists in the tree throwing out very large limbs horizontally from the bole for a considerable distance, which then suddenly assume a perfectly perpendicular direction, the bend or 'knee' thus formed by the limb being almost a right angle. This is very marked in almost all the silver firs growing at Ardkinglass, Argyllshire, where there are many noble specimens. Another very striking instance of this peculiarity of growth occurs at Conishead Priory, in Cumberland. This very peculiar-looking specimen measures in circumference, at 1 foot from the ground, 14 feet 4 inches, and at 3 feet, 13 feet 4 inches, and where it throws out the large limb it is 12 feet 4 inches. This quaint limb projects 19 feet from the trunk horizontally, and is 8 feet 8 inches in girth at the stem, and 8 feet 3 inches at the knee or elbow; the main trunk of the tree is 76 feet high, and the height of the erect stem of the side limb is not less than 65 feet.

"Notwithstanding these peculiarities of habit, the silver fir is a noble ornamental tree, and as such has been planted probably more than as a remunerative timber tree. This is, however, to be regretted, for in some instances to which we can point, where it has been planted largely and solely with a view to profit, when fairly established in suitable soil, it has made such rapid advances as to be unsurpassed by any other conifer, while the quality of its timber has been found to be superior to that of either spruce or Scots fir in these situations, and one is thus led to the conclusion that the value of the wood of the silver fir, when it has attained to over forty years of age, is not so generally appreciated as it deserves to be, if it were better known. Mr. M'Corquodale, of the Scone Woods, whose opinion on any subject connected with practical forestry is most valuable and reliable, recently told the writer that he was surprised that silver firs were not much more frequently and extensively planted in Scotland than they are, when there are to be found sites and altitudes, and soils so well adapted for the growth and development into timber of this valuable conifer. He found it in his own experience a far more profitable tree, at an altitude of upwards of 1000 feet above sea-level on the slope of the Grampian Hills, than either larch or Scots fir of the same age growing in the same plantation, which was about forty years old. With his usual urbanity and desire to afford further information on any important arboricultural question within his knowledge, Mr. M'Corquodale has kindly informed the writer of his experience of the silver fir on the Lynedoch estates under his charge. There we find many magnificent specimens of large dimensions. Measured in 1878, the largest tree was 110 feet high, with a splendid straight bole, girthing 13 feet 10 inches at 3 feet from the ground, and containing 425 feet of timber in the bole alone.

"Mr. M'Corquodale further communicates a very interesting and important trial he has been permitted to make in regard to the suitability of the silver fir for use as railway sleepers. In April 1877, when part of the Highland Railway near Luncarty Station was being relaid with new sleepers of Baltic timber, he was allowed to lay four well-seasoned silver fir sleepers, cut from a tree on the Logiealmond estate, alongside the sleepers of foreign timber, and the test has hitherto been very satisfactory; periodical visits annually to the spot, and examination of both descriptions of sleepers, induce the belief that, to all appearance, the test of tear and wear and durability is in favour of the home timber. It were well that this experiment should be tried on a larger scale, and in different localities, so as to afford a better average of the suitability of silver fir timber for this highly important department of commercial application; for doubtless, if the trials should prove satisfactory, as we have every reason to suppose they would do, the future value of the silver fir would be largely enhanced, and greater attention be paid to its more extended cultivation in suitable situations throughout the country.

"In other districts than Perthshire, the capability of the silver fir for producing good wood of more scantling, in a given space of time, than either spruce, Scots fir, or larch, has been demonstrated. At Springkell, Dumfriesshire, at an altitude of 260 feet, and in light soil, it far exceeds the growth of these. One silver fir, blown down there in the Tay Bridge gale of 1879, contained upwards of 80 cubic feet of timber in the bole, and had been only sixty-two years planted. Similar examples might be instanced from Blackadder, Berwickshire; Portmore, Peeblesshire; Blair-Drummond, Perthshire; and Penicuik, Midlothian, etc. At this last-named place some very notable examples occur. In a plantation near the lodge, one tree is found 11 feet 7 inches in girth at 5 feet, and 13 feet 10 inches at 1 foot from the ground. The stem rises straight and clean to a height of 45 feet, when it divides into three heads which rise to a height of 90 feet. Although evidently planted at the same time as other surrounding trees, this majestic silver fir now, with one or two others of the same species, towers proudly above all the other trees in the vicinity. Besides this advantage of early producing heavy timber, when once fairly started, the silver fir possesses another desirable quality. Its timber stands tear and wear well, and numerous instances of its durability might be stated. For instance, at Penicuik, a log of silver fir, used as a trough to carry a head of water to an overshot wheel, upwards of thirty years ago, with only a simple coating of tar, has served the purpose well, and remains as sound as on the day it had been cut. An additional recommendation of its timber is that it does not warp, rendering its value for building and other purposes more worthy of recognition.

"The only rival which the *Picea pectinata* has to fear in this country, from allied varieties amongst the more recently introduced coniferæ, is the *Picea Nordmanniana*, which closely resembles it in many salient features, but which entirely differs from it in one essential characteristic. While *Picea pectinata* in low situations is frequently somewhat marred in its young stages by its habit of budding early in spring, and thus having its leading shoot destroyed by the late frosts, causing the disfigurement to the tree in after years, by two or three strong shoots assuming the position of leaders;—the *Picea Nordmanniana*, on the other hand, by being later in commencing its spring growth, is uninjured by frosts, and therefore retains its natural and symmetrical form. So nearly allied in appearance are these two *Piceas* that young plants of the *Picea Nordmanniana*, grown from cones produced in this country, much more closely resemble young silver firs than their parent variety. This was very well observed by Mr. Bisset at Moncrieffe, near Perth, where, for the first time in Scotland, *Picea Nordmanniana* was known to ripen its seed. His young seedlings were all very healthy, but almost undistinguishable from common silver firs. This probably, however, arose from the presence of many flowering silver firs in close proximity to the parent *Nordmanniana*, so that the seedlings may have been hybridized by the fertilization of the cones with the pollen from these trees; and it will be interesting to watch if the shoots of these seedlings in spring are more liable to suffer from frost than those of the parent tree, or of any other *Picea Nordmanniana* growing in their vicinity.

"Whether then for mixed plantations, grouping, or for avenues, or specimen park trees, the silver fir may safely be classed as second to no other fir in this country, it is also admirably adapted for game preserves, thickets, or for shelter clumps; for in such situations, where a damp close atmosphere, under the drip and shade from other trees, prevails, it thrives admirably, and is better adapted for such positions than any other coniferous tree, excepting perhaps the yew."

PRUNING THE LARCH.

THE fact that the larch may be pruned with comparative impunity, leads some foresters to the conclusion that the practice is beneficial. But when it is considered that the oldest and finest trees in this country have never had either saw or edge tool applied to them for any purpose except the removal of dead or injured branches, the reasons for such a conclusion are not very obvious. Dead branches should certainly be removed as soon as they appear, but the living should, I think, be allowed to remain till the heartwood they are in connection with is fully formed. But very usually larch is grown too closely to enable the lower branches to exist. They die for want of an adequate supply of light and air, and they die usually long before their functions to the main stem or trunk can be dispensed with without detriment to the latter.

There can be no doubt that the retention of the branches of the larch for as long a period as possible, or till they naturally die, is of the utmost importance to the health of the tree and to the rapid development of timber. Every one who has had opportunity for observing the difference between a larch growing in the open and one that is surrounded by neighbours to the point of suffocation, must have been struck with the superiority of the former over the latter. The feathery branches of the free-grown tree have a manifest influence on the stem, for you observe that it is much thicker than the close-grown tree, and is also healthier and more vigorous. Perhaps more of larch disease or failure to bring it to good timber condition is caused by pruning and close-growing than by any other cause. Due care should be exercised by the forester for the timely removal of duplicate leaders, should they make their appearance, but I think there ought to be no other measure of pruning taken till after the trees are ten or twelve years planted, and even then it should be practised with great reserve.

LARIX.

FOREST WORK FOR THE MONTH.

ENGLAND.

THE phenomena of December are generally a mere continuation of the characteristics of the preceding month. Although sometimes it presents an improvement upon the gloom and disagreeableness of November, it often acquires a stern and wintry character towards its close. The mean average rainfall is nearly 2½ inches, and the mean evaporation about two-thirds of an inch. Last December the rainfall at the three undermentioned places was as follows:—

At Bristol,	rain fell on	18	days to a depth of	5·289 inches.
„ Glasgow,	„	22	„	5·44 „
„ Edinburgh,	„	18	„	3·63 „

ORCHARD.—When the weather will admit, continue to plant and prune fruit trees, and also continue the pruning of fruit bushes, such as gooseberries, currants, rasps, etc., and if possible finish them before the close of the month. Stiff soils should be dug up roughly, and exposed as much as possible to the action of the weather. Support lately planted trees, and repair and strengthen tree guards.

FENCES.—Continue to trim and dress thorn hedges; and cut, plash, and lay rough hedges of every kind, cleaning out their ditches, and making up their banks.

DRAINS.—The drainage of agricultural lands should be pushed on, so as to have all the works connected therewith finished up in good time for the spring work of the farm. Any works of this kind, however limited in extent, possess an importance in the economy of the farm and estate. And they should always be designed with care, and carried out in a systematic and efficient manner, under the direction of an experienced drainer. Where the gradients are not very pronounced, instrumental levelling should always be resorted to, and the gradients of the main drains carefully determined. In such cases, plugs should be driven in at short distances apart; sometimes necessarily at every chain length, having the depths of the drain at these points marked on them in pencil, as a guide to the excavator.

Examine all previously made drains, and remove obstructions. Keep the outlets open, and the field ditches cleanly scoured. Give particular attention to all open wood drains, ditches and watercourses, and remove all accumulations from them of branches, leaves, and other obstructions to the free flow of their waters.

ROADS.—Repair roads where necessary, and see that all stones used in making these repairs are properly broken before being placed on the roads. Avoid the reprehensible practice of spreading on the rough stones and breaking them afterwards; it is most unsatisfactory in its results, either for ease in traffic or for the solidity or durability of the road.

WOODS AND PLANTATIONS.—Continue planting when the weather is fine; but turn your attention to something else during the prevalence of frost. Evergreen shrubs are best left to the freedom of their own ways during this month, as none but the hardiest can be moved about with impunity at this season.

Continue thinning plantations, cutting underwood, and felling timber for sale or for use on the estate. I think it most inexpedient to place large parcels of standing timber upon the market beyond the early part of this month, particularly if much of the timber is scattered in hedgerows, or amongst fields where its fall and removal would interfere with the agricultural operations of the spring, or the economy of the farm in summer. The selection of such timber for sale can be best accomplished by the forester after the fall of the leaf in November, when he can see through the branches, and obtain a true perception of the effect of removing one tree from another. He can then see distinctly the attitude of each tree; observe the intimate conjunction or interlacing of the branches, and conceive the effect of any separation upon the appearance of those left to clothe and embellish the landscape.

NURSERY.—Collect cones of the fir tribe, and also berries of the hawthorn, mountain ash, as holly, and also keys of the common ash. Mix these respective seeds with sandy loam, and place them where they can be occasionally turned every two or three months. Examine seeds already stored, and do whatever you see necessary to their preservation. Plant cuttings of deciduous trees, and plant out layers of planes, limes, etc. Dig over roughly, or ridge up vacant nursery ground, to allow its pulverisation by the action of the weather.

PLEASURE GROUNDS.—Leaves that are now being blown about over the ground surrounding mansions should never be allowed to accumulate after the trees have become bare, but should be collected as speedily as possible, and in quiet weather removed to the depots to rot into manure. Accumulations of leaves upon the pleasure grounds in damp conditions of the atmosphere, contribute largely to the discomforts inherent in the season, and detract from those pleasures which the occupants expect to enjoy.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

PLANTING should be carried on so long as the ground is neither too wet nor too hard frozen. If too wet, the ground cannot be properly firmed about the plants, and the rootlets at same time suffer from being puddled in. And if the ground is hard frozen, apart from the difficulty of firming the plants, the trees do not succeed so well as when planted in fresh dry earth in its natural state.

On closely watching the growth of forest trees for a few years after planting, there is such a marked difference of their growth, that I think there are some circumstances connected with the operation as yet not properly understood.

In connection with winter planting, it is always desirable to have other work to turn to, as the state of the weather renders necessary, and the nearer to the place of planting the better, so as to economize time in changing from the one place to the other; and for this purpose draining answers well, either making new drains or cleaning old ones.

Thinning or cutting wood or timber are also kinds of work that can be done to good advantage in weather that does not suit for planting.

Lifting plants in the nursery, making cuttings of elder, privet, buckthorn, ribes, and berry bushes when such are grown. Also digging, ridging, and trenching ground, making up and turning compost heaps, etc.

Raking and collecting leaves in the policies where this work falls to the hands of the forester, and this, it need hardly be said, constitutes a very large, expensive, and important work on many estates. In the pleasure-grounds here, we collect annually several hundred cart-loads of leaves, which, in seasons of scarcity of straw, the surrounding small tenants and crofters cart home for bedding to their cattle, for which purpose they answer well.

Fences of all kinds should be kept in good repair, for in their case the proverb is truly applicable, " A stitch in time saves nine;" for by the timely driving of a nail, or putting in a post, which would only cost a few pence, several shillings can often be saved.

Hedge-pruning should be continued, young ones dug and cleaned, and any new ones that are to be planted should be proceeded with. Too much attention cannot be paid to the preparation of the hedge bed or ground into which the plants are to be planted. Not only should the ground be rendered dry by means of drainage, but the soil should be thoroughly pulverized, and for thorn I think lime is an advantage, applied to the soil one year before planting when that can be done; but even newly applied I never witnessed any bad effects from it, if not put immediately into contact with the roots of the plants.

Now that the surface is bare of grass, all pleasure-grounds should be gone carefully over, and the holes caused by the decay of old tree roots, filled with earth and firmly beaten down. Many accidents have occurred to both man and beast by the foot stepping into such holes.

Stools of trees that had been left high when cut, should also be reduced by means of the narrow-faced axe, by scooping out, or dishing the stool, as it is technically termed.

Seeds may also now be collected for trees and shrubs, such as the holly, thorn, brier, larch, Scotch fir, etc.

Birch for brooms, heather for the same purpose, and also for thatching houses, etc., should now be cut and stacked up.

Roads should be well attended to by keeping water off them, culverts kept clear and in good repair, and leaves swept off, so as not to litter and keep the surface wet, uncomfortable, and unsightly.

C. Y. Michie.

Cullen House, 25*th Nov.* 1885.

REVIEWS OF BOOKS.

Journal of the Royal Agricultural Society of England.
Vol. XXI. Part 2. London: John Murray.

THE half-yearly volume of the Transactions of the Royal Agricultural Society just issued is more than usually interesting. Professor Fream, of the Downton College of Agriculture, contributes a most excellent and exhaustive paper on Canadian Agriculture, dealing chiefly with the Eastern Provinces. In alluding to the flora of these provinces, he quotes from Professor Asa Gray, who gives the following as the list of the leading forest trees of British North America:—

"The coniferæ native to the British Islands are one pine, one juniper, and a yew; those of Canada proper are four or five pines, four firs, a larch, an arbor-vitæ, three junipers, and a yew—fourteen or fifteen to three. Of amentaceous trees and shrubs, Great Britain counts one oak (in two marked forms), a beech, a hazel, a hornbeam, two birches, an alder, a myrica, eighteen willows, and two poplars—twenty-eight species in nine genera under four natural orders. In Canada there are at least eight oaks, a chestnut, a beech, two hazels, two hornbeams of distinct genera, six birches, two alders, about fourteen willows, and five poplars, also a plane tree, two walnuts, and four hickories—say forty-eight species in thirteen genera, and belonging to seven natural orders. The comparison may not be altogether fair; for the British flora is exceptionally poor even for islands so situated. But if we extend it to Scandinavia so as to have a continental and equivalent area, the native coniferæ would be augmented only by one fir, the amentaceæ by several more willows, a poplar, and one or two birches, no additional orders or genera."

Referring to the destruction of forests by fires and other causes, Professor Fream points out the alarming extent to which Nova Scotia has been denuded of its timber. He tells us that in that province all or nearly all the timber lands will have been cut over for the first time by or perhaps before the year 1890. By careful husbanding, a second cut nearly equal to the first can in many localities be obtained after fifteen or twenty years, so that, if it were not for the forest fires, those lands which are well looked after would never become denuded of their timber. As it is, the supply of pine and spruce is rapidly approaching exhaustion, and the lumbering trade is on the decline. Large areas once covered with a stately growth of pine, spruce, and other trees have been rendered almost barren by fires. No discretion is exercised, nor is any protection extended to the forests in Nova Scotia; every man may cut as he pleases.

For other details respecting the Canadian forests we must refer our readers to the pages of the *Journal.* The remainder of the number contains a lengthy report on the 1885 Exhibition held at Preston, a report on Agricultural Education, as well as articles on Abortion in Cows, Rickets and Paralysis in Young Sheep, etc.

The Scottish Geographical Magazine. Edinburgh: Printed for the Society by T. & A. Constable.

THE November number of this spirited monthly contains a short and ably-written sketch of recent explorations in North-west Australia, by the honorary secretary, Mr. John Bartholomew, in which he points out the value of that colony as a field for the emigration of the poorer classes of this country. The description is accompanied by a well-drawn and nicely-coloured map. Undoubtedly the most interesting paper to Scotchmen is the Address of Mr. Thomas D. Wallace, F.G.S., read at the meeting of the British Association at Aberdeen on the Basin of the Beauly. The geography of the district in its prehistoric, geological, and forestal aspects is dealt with in a lively and exhaustive manner. An article on Geography and Trade in the East, by Mr. John Geddie, F.R.G.S., and the Report to Council, fill up the remainder of the number.

The Naturalist's World. November. Ilkley: Percy Lund & Co.

THIS popular little monthly maintains its character for racy and chatty articles of interest to amateur naturalists. An article on a Visit to Kew Gardens, and another on Herons and Heronries, are the chief features of the current issue.

TRADE CATALOGUES RECEIVED.

Descriptive Catalogue of Forest Trees, Conifers, Shrubs, and Fruit Trees, Roses, etc. Little & Ballantyne, Nursery and Seedsmen to the Queen, Carlisle.

General Catalogue of Forest Trees, Fruit Trees, Roses, Herbaceous and Alpine Plants. Howden & Co., Inverness.

LETTERS TO THE EDITOR.

SIR,—Will you kindly inform me what kind of tree you would recommend for a shelter hedge in this neighbourhood? I want the hedge to be ever green, so that I may have the advantage of the foliage as a windbreak, and an ornament in winter as well as in summer. SYLVA.

STRANRAER.

The difficulty in your case is to choose, the material is so abundant. The exceptionally favourable position you occupy, enjoying as you do a very high mean annual temperature, opens up a very wide range of evergreen trees and shrubs adapted to your purpose and the locality, which would succeed in very few other parts of the country in the same latitude. Had you stated whether you wanted to trim closely or otherwise, we should have been better able to advise directly, and name one or two subjects adapted to meet your wishes. There are many evergreen coniferæ that thrive well in your neighbourhood, and in very few other districts in the British Islands. One of the most beautiful of these, and one, too, which will bear moderate pruning, is *Cupressus macrocarpa*, splendid specimens of which you may see at Castle Kennedy in your own neighbourhood. *Thuja Lobbi* and *Thuja Warreana* or *siberica*, both handsome conifers, would also suit your purpose, and will bear moderate cutting. *Ligustrum ovalifolium* (oval-leaved privet) is also a rapid-growing evergreen shrub that is specially adapted for hedge purposes, as it will bear close pruning well. But the best of all evergreen hedge plants is the holly, of which there is considerable choice of variety. The common holly is that most generally used, because it is the cheapest; but the variety called Hodgin's is hardier, and a more rapid grower, and has larger and deeper-coloured foliage.

WOOD SALES.

KENT.—The great underwood and plantation sales now being held in Kent are going off very badly. The depression in prices is most severe in the better class of woods, from which hop poles are mostly supplied. The fall in the price of hop poles in consequence of the low value of hops is quite unprecedented. For the best woods of Mid Kent the biddings have been extremely slow, and fully 30 per cent. under last year's prices.

WORCESTERSHIRE.—Messrs. Oates, Perrens, & Woldridge sold by auction at Droitwich, on Tuesday, 10th Nov., 980 elm and ash trees, on the High Park, Mayhouse, and Copcut estates, of various sizes up to 300 feet. The elm was particularly fine, and the sale attracted purchasers from all the surrounding districts. The saleroom at the Raven Hotel was crowded with competitors. Mr. Woldridge, in opening the sale, observed that the superior character of the timber and the very large attendance of buyers rendered remarks on his part superfluous and unnecessary. The sale was very spirited throughout, and it was the general opinion that the elm realized 10d. per foot, and the ash 2s. per foot.

MISCELLANEOUS.

White Mountain Forests.—The New Hampshire people, like those of New York, are becoming awakened to the importance of preserving their forests. The White Mountain forests in the former State are of the same physical and commercial importance to the country as the Adirondacks forests, alluded to in our last issue, are found to be in the State of New York. The forest land is a reservoir which furnishes water to the scores of prosperous towns in the adjacent country. A recent legislative Commission reports that 58 per cent. of the State of New Hampshire is forest land, and says further that the manufacturing interests dependent on the White Mountain should not be asleep on such a vital question, and that it should devise some plan by which the forests of that State can be perpetually preserved.

The Proposed School for Forestry.—The Select Committee of the House of Commons, appointed on the motion of Sir John Lubbock to inquire into the desirability of establishing a Forest School in England, recently took the evidence of Mr. W. G. Pedder, Revenue Secretary of the India Office, and well acquainted with the forestal system of India. Mr. Pedder stated that a Forestal Department was authorized in Bombay in 1846. About that time the revenue of the Indian forests was £40,080. Since then it had risen to a gross revenue of nearly £1,000,000, and a net revenue of over £400,000, and that, he considered, was undoubtedly due to the increased education of forest officials. Instructors were obtained from France and Germany, but latterly chiefly from France, because it was found that the woodlands of England and Scotland were not so well managed as to enable the managers to give instruction.

——Dr. R. Harvey Reed, of Mansfield, Ohio, after a study of the subject as it affects its own State, concludes that among the results of the destruction of the forests and the drainage of the land are more wind, more humidity, more rainfall, more dust, more sudden dashes of rain, more sudden changes from one extreme to the other of temperature and moisture, more rapid transmission of water from the periphery to the great basins, robbery of the natural regulators of distribution and diminution of the common supply of springs and wells. These changes have been followed by a decrease of all forms of malarial diseases, and an increase of typhoid fever, catarrh, deafness, and chronic pulmonary troubles, and the increase in wind and dust favours the spread of zymotic and contagious diseases.

THE DIAMOND WILLOW (*Salix cordata var. vestita*) is a low tree, growing in the valley of the Missouri river, in Iowa and Nebraska, and westward to the 110th degree of longitude, and it has been known chiefly from the canes with diamond-shaped projections, which can easily be whittled out of it by following the grain about the knots. It grows readily and rapidly, and W. L. Brockman states in the Minnesota *Farmer* that it not only serves from its habit an admirable purpose as a wind-break in the sections where such protection is needed, but will furnish a most elastic and durable wood for vineyard stakes and the like. It is said to be almost indestructible under ground, and will grow three sets of posts as good as red cedar while one of the latter is maturing. It is also good for fuel, being harder than other willows, and its specific gravity being about that of black walnut.

BUYING AND SELLING TIMBER ON THE CONTINENT.—A traveller in the south of France was recently passing through a forest, when he suddenly met a dozen, as he thought, suspicious characters. His first thought was how to make his escape; but to his great astonishment, one of them came forward, and, after some general conversation about trees, suddenly offered one hundred napoleons if he would retire. The traveller said he had no objection, and, to his surprise, the sum was given him, and he went his way rejoicing. He applied to the authorities, when he discovered that a large sale of forest trees took place that day, to which the local buyers had been bidden, and these men composed a "knock-out"—that is, conspired to prevent any one else bidding, in order that they might obtain the timber at a cheap rate. The traveller was supposed by them to be a well-known timber merchant, and to have entered the forest for the purpose of bidding; so he was bought off.

STEEL SLEEPERS.—Replying to the assertion of Sir Michael Hicks-Beach as to the Midland Railway Company purchasing steel sleepers from Belgian firms, Mr. Charles Thomas, one of the Directors of the Midland Company, stated that the Railway Company had done good service to the English manufacturers by bringing the important matter before them, as the substitution of steel for wood would mean £250,000 now paid to Russia, Norway, and Sweden being spent at home. The Company had now accepted the tender of an English firm for 250 tons of sleepers.

IRISH FORESTS NEARLY 300 YEARS AGO.—The value of Irish timber seems to have been very well appreciated by the English Government at a comparatively early period. Under date 27th October 1608, Lord Deputy Sir Arthur Chichester writes to Lord Salisbury that the bearer of his letter is "Mr. Mytten, the man with whom he has conferred touching the use and profit that is to be made of the timbers of this kingdom, in which his experience can give his lordship the best satisfaction. He and others have bought the woods of Shillelagh of Sir Henry Harrington, the greatest part whereof they intend to convert into pipe staves, but he (Mytten) is now to repair to his lordship (Salisbury) before they proceed further therein. It is thought that those woods, and others adjoining, some of which belong to the king, will yield sufficient store to furnish the king for his shipping, and other uses, for twenty years, and yet have then wherewith to hold up their trade." Lord Deputy Chichester then refers to other places in Ireland, remarking that "the woods in Munster are greatly wasted, especially upon the rivers that are portable to the sea, but undoubtedly much timber is to be found within the land." Chichester proceeds to suggest that "Mr. Mytten, or some such competent person, should be appointed as Woodward, or by some other such title, to survey all the woods in the kingdom. In June 1610, the Privy Council direct the Lord Deputy to take precautions for the preservation of woods in Ireland. On 12th December 1610, Chichester reports that he has suggested the setting up a forge or two, to work the ironstone in Munster. Such forges gradually burnt out Irish forests, next to nothing being planted to supply what was taken.

THE American elm was once considered of little economic value. If it could have been put to use, the grand specimens which have made so many New England and other towns famous would have been chopped down with the oaks and pines. Being considered of small account for any other purpose, the trees were allowed to remain for ornament. But the wood is now exported in considerable quantities to England to be used in building ships and boats, while at home it is in demand for saddle-trees, wheel stock, etc. On rich ground it would be a paying tree for timber plantations. It grows rapidly, and when large enough to be used for hubs it would command a ready market.

SCARCITY OF TIMBER IN AMERICA.—The threatened scarcity of timber is attracting attention to certain woods now neglected. Virginia sap, hitherto practically valueless, is becoming an important article of trade; one Philadelphia dealer recently shipped a lot of it West, and sold it well. Millions of feet of swamp oak are yearly destroyed for lack of enterprise to turn it into clap boards. It is straight-grained, clear of knots, large in diameter, dense, and tough. Sweet gums are found susceptible of high polish. Wood needs more study. Different woods require to be put to different uses, according to their endurance and fitness. The country has been scoured for stave timber, and only after failing to find a supply was red oak resorted to.

THE FOOD OF PLANTS.—Plants feed from elements formed in the soil, air, and water. The mineral food comes from the soil, as does a large amount of their nitrogen. Their carbon, oxygen, and hydrogen, and a part of their nitrogen, come from the air and from water. Food for plants must be in solution before they can appropriate it. Nothing, of course, can be taken up by the roots except it is in solution. Hence the necessity of having the soil moist, and hence the damage done by drought.

EUCALYPTS.—At the Linnean Society on November 5, there was shown for the Baron von Mueller, of Melbourne, a characteristic collection of skeleton leaves of species of eucalyptus prepared by Mrs. Lewellin, of Melbourne. These confirm Baron von Mueller's observations as to definite layers and the relation of these to the skeletonizing process. The leaves in decaying produce no bad odour. Mueller's observations do not support Mr. Riviere's statement that the bamboo is as good as eucalypts to subdue malaria; the former dry up, but do not exhale the volatile oil, as do the latter, and the eucalypts, moreover, absorb moisture as quickly as willows, poplars, and bamboos.

BEECH LEAVES AS STUFFING FOR MATTRESSES.—Sir J. D. Lauder says: "We can from our own experience bear testimony to the truth of what Evelyn says as to the excellence of beech leaves for mattresses. We used always to think that the most luxurious and refreshing bed is that which prevails universally in Italy, which consists of an absolute pile of mattresses filled with the elastic spathe of the Indian corn,—we mean that delicate blade from which the large head of the plant bursts forth. Those beds have the advantage of being soft as well as elastic, and we have always found the sleep enjoyed on them to be peculiarly sound and restorative; but the bed made of beech leaves is really no whit behind them in those qualities, whilst the fragrant smell of green tea, which they retain, is most gratifying. The only objection to them is, the slight crackling noise which they occasion when a person turns in bed; but this is no inconvenience at all, or if so it is an inconvenience which is much overbalanced by the advantages of this most luxuriant couch."

TREES OF THE UNITED STATES.—We learn from the *Scientific American* that there has recently been added to the collection of the Museum of Natural History, New York, an almost complete series of samples of the trees of the United States. There are between 400 and 500 sections of the trunks of different species. The specimens are about 5 feet 8 in. long each, and cut in such a manner as to display their bark and the transverse and longitudinal sections of the wood. This is done by cutting away one side of each specimen at the top to the depth of one-half the diameter of the trunk and for one-third of its length. One-half of each exposed portion is polished to illustrate the effect of this treatment of the wood, the remainder being left in the natural state, with the top of the upper divided part finished by bevelling—a method of very obvious advantage to those interested in the commercial value of timber. Among the more remarkable specimens enumerated is a plank of *redwood* 8 feet wide; a specimen of Engelmann's spruce 24 inches in diameter, which, by the number of concentric rings, is alleged to be 410 years old, being the oldest tree in the collection; a specimen of the wood of Catalpa—which species is not stated—is presented with the information that it has been buried in the earth for seventy-five years, and is yet perfectly sound in condition.

FOREST COMMUNISM.—In the township of Freudenstadt, at the foot of Kniebis, in Baden, not a single farthing of taxation has been paid since its foundation in 1557. The commune possesses about 5000 acres of pine forest and meadow land, worth about £10,000 sterling. The 1420 inhabitants have each as much wood for their building purposes and firing as they wish for, and each one can send out to pasture, during the summer, his cattle which he feeds during the winter months. The schools, church, thoroughfares, and fountains are all well cared for, and every year considerable improvements are made. 100,000 marks were employed in 1883 for the establishment in the village of a distribution of water with iron pipes. A hospital has been built, and a pavilion in the market-place, where a band plays on the fête days. Each year a distribution of the surplus revenue is made amongst the families, and they each obtain from fifty to sixty marks or shillings, and more still when an extraordinary quantity of timber has been sold. In 1882, 80,000 marks were distributed amongst the 1420 villagers.

DURABILITY OF WOOD CUT IN SPRING AND IN WINTER.—Timber cut in the spring is, according to some authorities, not so durable as that cut in winter, and recent scientific investigations appear to sustain this belief. It is shown that the richer the wood is in sulphuric acid and potassium, the more liable it is to rot and mould. Wood cut in the spring months contains eight times as much of the former and five times as much of the latter as wood cut in the winter; hence it is concluded that the best time to cut down trees is winter. It would be interesting to have the opinions of experienced practical men on this point. It is a fact that trees are felled at all times from late autumn till late spring, much in accordance with convenience, custom, and other considerations. The question as to whether the above-noticed deduction applies equally to resinous and non-resinous trees deserves special consideration.

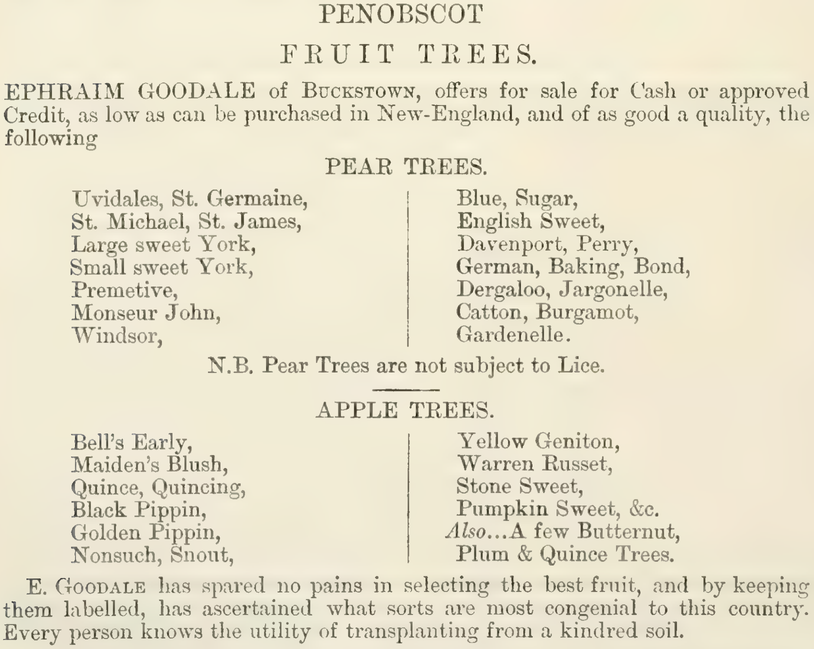
THE PLANTING OF TREES IN TOWNS.—Baron Huddleston and Mr. Cave had before them in London, on Tuesday, 24th November, the case of The Queen *v.* The Corporation of Lewes. Mr. Lumley Smith, Q.C., applied for a rule calling upon the defendants to show cause why a fine should not be imposed upon them, and why they should not remove certain trees which they had planted in one of the principal streets of Lewes. An indictment against the Corporation was tried at Lewes, and the jury found that the trees were a nuisance. The Corporation had removed two dead trees; but they had planted one in place of a dead one, and they persisted in keeping seven or eight other trees. It was under these circumstances that he made the present application, in order to have the nuisance abated. Rule granted.

CORK.—It is generally believed that this useful production is the true bark of the cork oak (*Quercus suber*), but this is an error. The true bark of the tree underlies the spongy substance commonly known as cork, which is an excrescence merely that can be removed from the tree without injury, but rather benefit, for growth is improved by its being removed. The tree is in fact cultivated and fostered for and by the removal of this external envelope of the bark. It is generally twenty or twenty-five years before a tree yields a gathering of cork. The first gathering is called virgin cork, and is familiar enough as material for the formation of rustic work, but is no use for cork-making. The next gathering, which is taken after a lapse of about ten years from the period of the first gathering, is of superior quality, and each successive gathering improves in quality, but it is not till the third gathering that really superior cork is obtained.

A PROFITABLE INVESTMENT.—The cultivation of the cocoa-nut palm is said to be the most remunerative branch of American farming. The trees do not produce much fruit until they are ten years old ; but afterwards they continue prolific for nearly a century, and the yearly yield of each is worth, on the average, 15s. in New York. In the extreme south of Florida an enterprising native of New Jersey has planted 200,000 palms. Land, labour, and trees have cost him only £20,000 ; and he expects, in two or three years' time, to be earning a clear £120,000 annually, or 650 per cent. interest on his invested capital. The prospect is a seductive one ; but lest British fathers with younger sons should dream of sending their hopefuls to grow cocoa-palms in Florida, we may as well add that in the nothern hemisphere the valuable nut can only be cultivated near the sea, and south of lat. 27, and that the New Jersey speculator, with commendable prudence, has bought up the only tract of land in the United States that is exactly suitable for the purpose.

The Traditional Origin of the Walnut Tree as given by Folkard is interesting: it is in substance as follows:—Carya, the youngest of the three daughters of Dion, king of Laconia, received, in common with her sisters, the gift of prophecy from Apollo as a reward for the hospitality the god had received from her father. The god stipulated that they should never abuse the gift, nor by its power endeavour to penetrate mysteries which it was improper for their sex to fathom. This stipulation was violated when Bacchus declared his love for the youngest daughter Carya. The elder sisters being jealous, endeavoured to prevent Bacchus from meeting Carya, and he in revenge turned them into stones and transformed the object of his love into the walnut tree, the fruit of which was considered by the ancients to promote the powers of love.

An Ancient Nursery Catalogue.—We publish herewith a reduced facsimile of a catalogue or circular of nursery stock, which is probably one of the earliest ever issued in this country. The original circular is 6 by 9 inches in size, and is reproduced for the *Prairie Farmer* by photo-engraving:—



PENOBSCOT

FRUIT TREES.

EPHRAIM GOODALE of Buckstown, offers for sale for Cash or approved Credit, as low as can be purchased in New-England, and of as good a quality, the following

PEAR TREES.

Uvidales, St. Germaine,
St. Michael, St. James,
Large sweet York,
Small sweet York,
Premetive,
Monseur John,
Windsor,

Blue, Sugar,
English Sweet,
Davenport, Perry,
German, Baking, Bond,
Dergaloo, Jargonelle,
Catton, Burgamot,
Gardenelle.

N.B. Pear Trees are not subject to Lice.

APPLE TREES.

Bell's Early,
Maiden's Blush,
Quince, Quincing,
Black Pippin,
Golden Pippin,
Nonsuch, Snout,

Yellow Geniton,
Warren Russet,
Stone Sweet,
Pumpkin Sweet, &c.
Also...A few Butternut,
Plum & Quince Trees.

E. Goodale has spared no pains in selecting the best fruit, and by keeping them labelled, has ascertained what sorts are most congenial to this country. Every person knows the utility of transplanting from a kindred soil.

The Annual Report of the Maine Pomological Society for 1873-74 says of this document:—

"Very early in the century, Ephraim Goodale established a regular nursery for the propagation of trees, undoubtedly the first one in the State, in the present town of Orrington; and he issued a catalogue, meagre indeed in comparison with the voluminous and elegant nursery catalogues of the present day, but denoting great enterprise in the time and under the circumstances of its promulgation. The Hon. S. L. Goodale, in a letter written in 1873, in answer to inquiries, says: 'I send you herewith the only copy which I remember to have seen of what I suppose to have been the first catalogue of nursery trees issued in Maine. The date is wanting, but it was as long ago as when what is now Orrington was a part of Buckstown, and from other facts I doubt not it was between 1804 and 1812. Ephraim, the eldest of the brothers, and my father,—now living at the age of eighty-nine,—the youngest of a large family, went there and took up farms near each other about the beginning of the century, and at once, or as soon as land was cleared, began the culture of fruit, bringing trees from their home nurseries in Massachusetts. My father was compelled by loss of health to leave, but his brother continued many years to raise trees to sell and fruit for market.' It is a little remarkable that most of the fruits named in this catalogue are still classed among standard varieties. Uvalede's St. Germain, York, Bergamot, Primitive, Monsieur Jean, Windsor, Sucre Vert, English Bergamot, and German Baker, of our modern pear lists are doubtless the same as those mentioned. The others are not so easy to identify. Of the apples named in the old-time catalogue, Bell's Early, Maiden's Blush, Quince, Golden Pippin, Nonsuch, and Pumpkin Sweet are probably identical with the present varieties of the same names. The 'Yellow Geniton' is now the White Juneating, the 'Stone Sweet' was doubtless our Stone Pippin. The 'Warren Russet' is not easy to identify with any present sort. It may have been the Yellow Bellflower, of which a synonym is the Warren Pippin. It is evident from the concluding paragraph of the little catalogue that this pioneer nurseryman of Maine conducted his business upon correct principles, at least to the extent of keeping his stock carefully labelled, and cultivating the sorts most congenial to the soil in which they were designed to grow. It is pleasant to learn that 'in 1821 he was known as Judge Goodale of Orrington, a contributor and liberal benefactor to the Penobscot Agricultural Society at its first exhibition.' "—*Prairie Farmer*, Nov. 7, 1885.

CHIPS.

As the result of arboriculture, birds are making their appearance in Dakota that were never seen there before. Quail, in particular, are abundant.

It is stated that of 100,000,000 feet of lumber on the docks at Oscoda and Au Sable, only about 5,000,000 feet remains on the market. The bulk of the stock sold goes to Chicago.

The forests of the United States are disappearing at the rate of 25,000,000 acres a year, and there are only 445,400,000 acres of forest in the country.

By carefully conducted experiments, Mr. J. C. Arthur has demonstrated that bacteria are the direct cause of the disease known as pear blight. Sap from an affected tree invariably produced the disease when inoculated into a healthy tree.

Belgian State Forests.—Since the 1st of August, the administration of these forests has been detached from the care of the Minister of Finance and reunited to the Department of Agriulture and Public Works.

The 26th of October, E. J. Copley's circular mill at Copley, Lake Co., Mich., cut 129,552 feet of pine lumber with one saw in eleven hours. This is claimed to be the largest cut ever made with one saw.

One of the reasons why small groves of forest trees on old land make slow progress is because the vegetable matter in the soil is exhausted. It takes time and the shedding of leaves for several seasons to renew the soil. Mulching such land even with straw will pay, as it will keep down the grass until the increasing shade from the trees is sufficient to do it.

The Lime.—It is said the first two lime trees brought to this country were planted at Hatstead in Kent, in 1590.

Sugar Maple is found in great quantities in all the middle States of the American Union, but those which grow in New York and Pennsylvania yield more sugar than those produced in Ohio. The wood of the sugar maple is reckoned the best of any of the American trees, and its ashes afford an exceptionally large amount of potash. The tree arrives at maturity earlier than perhaps any other of its tribe, or within a period of 20 to 30 years.

Growth of the Horse Chestnut.—The growth of this tree is in ordinary circumstances made in shorter time than that of most deciduous trees. Within three weeks of the time of the unfolding of the buds, the entire length of the shoot for the season is usually attained, and it is only in exceptional seasons when the summer may have been very hot and dry, and followed by early autumn rains, that any attempt is made at second growth, which even when it occurs is more partial than in the case of most other deciduous trees in the same circumstances. Not any other of our cultivated trees makes its growth more quickly nor requires so long a period to consolidate its tissues and mature its buds.

The Wood of the Chestnut (*Castanea vesca*) so greatly resembles that of the oak, that differences of opinion have arisen as to which of these timbers old structures are composed. Such is the case with regard to the roof of Westminster Hall, formerly thought to be of oak, but now ascertained to have been constructed of chestnut; these two woods are distinguished from each other by the transverse fibres of the chestnut being more confused than those in the oak, and much less perceptible to the naked eye.

FORESTRY

JANUARY 1886.

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EDITORIAL NOTES.

SCHOOL OF FORESTRY.—We beg to direct the special attention of our readers to the interesting article on the above subject appearing in the present number. It is satisfactory to be able to record some progress towards a practical solution of this important question.

WE learn that Mr. Robb, the American senator, who has arrived in France for the study of the forestry question, has been well received by the Government, who have afforded him every facility for pursuing his investigations.

HER MAJESTY'S WOODS AND FORESTS.—A Blue-book is just to hand containing the annual report of the Woods and Forests Commissioners. The amount paid into the Exchequer in the last financial year out of the revenue arising from the woods, forests, and land revenues, after deduction of all expenses of management, except the salaries and expenses of the official establishment, etc., was £380,000. This is the same amount as was paid into the Treasury in each of the three previous years, but £10,000 less than was yielded in the years 1880–81, and £30,000 less than was realized in each of the years 1877–78–79. The decrease in the past six years is principally to be attributed to the severe agricultural depression.

THE retirement of Sir Joseph Hooker from the directorship of Kew Gardens is a national event that will cause universal regret. The Hookers, father and son, have for such a long period been favourably identified with the administration of the great National Botanical Gardens, that all sections of the public will receive the announcement of Sir Joseph's retirement with genuine concern. We say all sections of the public advisedly, for the influence and importance of Kew Gardens to science, the arts, commerce, national economy, and even the pleasure and recreation of the people, has become universal under the enlightened direction of the Hookers. Sir William Hooker, the father of Sir Joseph, was appointed to the Directorship at a time when Kew Gardens, as a scientific establishment, had fallen to zero. It was soon seen that the appointment was a most fitting one. With characteristic energy Sir William brought his high intelligence and scientific attainments to bear with immediate effect on the work of reforming and expanding the sadly neglected establishment over which he was called to preside. The collection of plants was rapidly enlarged, as well as improved in condition; the herbarium was established and was soon destined to take the first rank as such in the world. The museums, rich in economic and art interest, were developed slowly at first, but solidly and with such breadth of base that now they stand unrivalled as collections illustrative of economic and physiological botany. Sir Joseph became Assistant-Director to his father about thirty years ago, and about ten years thereafter, at Sir William's death, was appointed Director in his stead. During the twenty years that he has administered the affairs of Kew Gardens they have prospered well. Progress in the cultivation and enlargement of the collection and the facilities for its accommodation, the extension of the museums and the herbarium and the arboretum; the improvement of the grounds from the point of view of taste, and for the purpose of recreation, have been followed up by Sir Joseph with untiring zeal and energy. But by far the most important, though the least known of his works in connection with the great charge he has so long and ably directed, is his endeavour to establish intercolonial interchange of information and plants of universal economic value. The success that has attended his efforts in this direction cannot yet be fully computed; but as the principal and most active agent in the introduction of the cinchonas into India and other suitable climates, at a time when their extinction in South America was imminent, he ranks as a national benefactor. Through Kew also, under his direction, have been dispersed caoutchouc, gutta-percha, tea trees, and many other trees and plants of economic value, into countries under British rule, where their products are already assuming importance in the trade and revenue of the empire. Sir Joseph's life has been one of ceaseless labour, and latterly also of overwhelming responsibility. Besides his directorial duties he has voluntarily engaged in a successful work of such magnitude and detail as would form a full life's record for most men of even more than average industry. It is in order to complete the last and most important of his many works that Sir Joseph has decided to retire at present. He has been occupied for several years past on the *Flora of British India*, and there is yet a large portion of it to elaborate. No living botanist has the same eminent fitness for this task, and we sincerely hope not only that he may be granted health and strength to complete his congenial task, but also be long spared to enjoy the high admiration and esteem which his great abilities and many excellent personal qualities have inspired in as wide a circle as is given to most men to influence.

REAFFORESTATION AND THE PROPOSED FORESTRY SCHOOL.—In a recent issue of a contemporary we notice an article on American forests, the general scope and bearing of which is to throw cold water on the idea of reafforestation of the British Islands and the establishment of a Forestry School. In speaking of the importance of forestry as a national resource relatively in this country and in America, the writer speaks truly when he characterizes what we could do as "insignificant." There is no gainsaying this somewhat gratuitous assertion, but surely if we can do comparatively little, we should at least do that little thoroughly well. We don't for a moment suppose that the writer would be prepared to aver that there is no room for improvement in the practice of forestry in this country, or that improvement would not pay. True, he says "the ability of the British forester in the matter of arboriculture is admitted;" it is only in sylviculture that he is deficient, which is admittedly a more simple matter, being "simply arboriculture in the rough. Given the forests or given the occasion when a start is to be made on the national scale, and it will be found that there is an abundance of latent knowledge that will be forthcoming, and will be equal to the occasion. War is said to develop the great general; he cannot be made up as a tailor would a dandy." The relevancy of the dandy and tailor to the general and war is not very apparent, nor do either appear to have much relevancy to the argument, except it be implied that it is a useless process to educate a soldier in the art of war in order that he may, when the emergency arises, prove himself a great general. We assume this to be a fair interpretation of the writer's drift and meaning; he sees no necessity for a higher education for our foresters. He would have them rely on the "abundance of latent knowledge," which he alleges exists, and trust the Fates it "will be equal to the occasion." He would do nothing to meet the occasion, but rather place stumbling-blocks in the way; and when he hears "that India and the Colonies are begging all around Europe for foresters," he marvels and sneers at the sad picture of "colonial imbecility" that fails to develop the "article" on the spot. Colonial imbecility may be left to answer for itself, in that while it has discerned its necessity for foresters, it has also been able to perceive that the quality wanted was not to be found in Britain without first being "*hall-marked*" in the French or German schools. While our foresters are no whit behind their continental brethren in all cultural and mechanical matters pertaining to their art, it must be conceded that they are as a rule inferior in technical and scientific knowledge. We know there are many exceptions, and could name not a few men whose self-acquired technical knowledge, and whose intimate acquaintance with the "ologies" covertly sneered at by the writer in our contemporary are an honour to them, and no doubt also a source of pleasure and recreation thoroughly appreciated by them, while the possession of these acquirements in no way lessens their value as practical men, but rather greatly enhances it. What we want is more of this sort of men amongst our foresters, and this is why we wish to see a Forestry School established. We readily admit that great foresters are not to be made in schools any more than great generals, but we have no right to expect either if we do not provide the means for their acquiring both the practical and technical education required to enable them to perform their part in the one art or the other.

Eucalypts in Italy.—We learn from a German authority that the plantations of eucalypts made in malarious districts in Italy have so far proved a failure. The trees do not grow: either the soil or the climate, or both, are unfavourable. This is somewhat wonderful in a tree that in this less favoured climate makes astonishing progress in summer; only, however, in the milder districts, and not always in even them, to be spared by our severe winters. It is not only wonderful, but disappointing, that a tree which a few years ago was trumpeted so loudly as a specific against malarial fever, should fail in the largest experiment ever tried with it. We are afraid it is no fit subject to plant in marshes, for even if it succeeded in growing well, the growth would be of such a spongy nature that winter's frost even in many parts of sunny Italy would be fatal to it. We find the same authority recommending *Laurus glandulosus*, various American and Indian *Acers, Salix Babylonica*, and several poplars as substitutes for the eucalypts, and claiming for them several febrifugal properties to those claimed for the eucalypts. We are not aware that this claim for the latter has ever been advanced on reliable grounds, and this grand Italian experiment having failed, we are not likely soon to have the point satisfactorily settled.

American Holly Boughs for Christmas Decorations.—Our American cousins are not so favoured as ourselves in the supply of holly branches for decorating their homes at Christmas-tide. Our European hollies do not endure the intense winters, nor the heat and drought of the summers of most parts of the United States; the extremes of climate are too much for them. Still holly branches must be obtained at Christmas by our American friends as surely as roast beef, plum-pudding, and mince pies, for they like all the associations of the great annual festive season as dearly as we do at home.

There are a few species of holly indigenous to North America, but only one of them very nearly resembles our common holly which with us and in northern Europe generally is regarded as the correct thing wherewith to wreath Father Christmas. This American substitute for our common holly is *Ilex opaca*, a species with flatter leaves, but equally spiny, usually a little larger but not so deeply green; in short, it is not so fine a subject as the common holly for the purpose, but is the only native product that may be used in the place of our more showy sort. It grows in moist places along or near the coast from Maine to Pennsylvania and Virginia southward; and at Christmas-time is distributed in great quantity throughout the country from these regions, packed in long wide boxes, forming rather an important item in the florists' trade at this festive season.

THE INFLUENCE OF FORESTS ON CLIMATE.—In publishing the results of many investigations on this subject conducted at many differently situated stations on the Continent, Herr Woelkof draws the general conclusion that in summer the earth and air of forest areas are relatively lower in temperature, less variable, and more humid than those of adjacent treeless regions; and that in winter the differences are trifling as regards humidity and temperature, but that the forest still remains the least variable in the latter respect. In a popular sense this conclusion has been held by our fathers and grandfathers as the result of common observation, although it has not perhaps been hitherto attested by careful scientific investigation. It is observed that there is a very great difference in the degree of evaporation that goes on in forests and continuous open areas. So great is the influence of forests in diminishing evaporation from the soil and the water within their areas as compared with open regions lying close to them, that neither shade nor the lower temperature and higher humidity combined are considered sufficient alone to account for the disparity. Herr Woelkof considers the influence of wind, which has not, he thinks, been fully appreciated in relation to this matter, is the most important factor in producing this difference. He is inclined, indeed, to ascribe to the absence of regular currents and unimpeded atmospheric motion which prevails in forests more power in limiting evaporation than is exerted by all the other deterrent conditions combined. The resistance opposed to the wind by masses of trees during the warm months prevents the rapid absorption and removal of moisture from the forest area, while the treeless tract is being parched by the currents which sweep resistlessly over it from the forest. And to this immunity of the forest from disturbing currents, and even from the effects of storms, is no doubt due to a large extent also the relatively less variable temperature and higher atmospheric humidity. With regard to the influence of forests on rain and snow fall, it would appear that the conclusion arrived at is confirmatory of that generally held, that it tends to increase both. But it is observed that the increase obtains chiefly in the winter months,—a circumstance ascribed partly to the clouds being lower at that season, and to the resistance presented by the trees to the prevailing winds, thus leading to heavy precipitation within their own area, and dispersion through upper currents of the broken clouds to the open tracts beyond.

A STRANGE OBJECTION TO THE PROPOSED FORESTRY SCHOOL.—Under this heading we took occasion in our November issue to controvert the argument advanced by a writer in a contemporary, that a School for Forestry would have the effect of turning out pupils only of pattern-like similarity. We had no thought of launching on a discussion of such a simple issue, but left the writer in question to account for the immense diversity of individual achievement effected by professional and commercial men in their subsequent career, who have received their education at the same school or under the same system. We observe he makes an attempt to do this in a recent issue of our contemporary—but to our mind signally fails. He admits our argument, and yet endeavours to nullify the conclusion to which it leads up. He says "it is implied that men of great diversity of attainments are turned out from the same school," and he somewhat grudgingly admits "that this sometimes happens, as there are certain characters who will push their way, however unfavourable their surroundings may be; but as a rule, I believe—I am now of course speaking of elementary schools—that the school leaves its marks behind, and that there is often a great similarity in the scholars educated under any particular *régime*." Yes, certainly we readily admit the fact that the school leaves its marks behind. It is a necessity of the relations that exist between the master and pupils in any school, that the former should impress the latter in one way or another. But we think the impressions are as diverse as the pupils themselves, and range between the marks of successfully trained intelligence, and the less advantageous but equally appreciable marks of the "*birch*." We think all candid observers will admit this general conclusion. But it is not quite so easy to admit the ultimate bearing of the half-hearted admission "that there are certain characters who will push their way, however unfavourable their surroundings may be." We take it our friend means by this statement to imply that the surroundings of schools are unfavourable, and that only certain characters are strong enough to rise above their influence and shine in their after occupation despite the trammels of the schools. Well, no doubt the system of elementary schools is not all it should be, but they certainly tend to discipline the pupils and enlarge their understandings on general and technical matters in an elementary way; and if some only rise above mediocrity in their grasp of the subjects taught, surely that is only a proof of our contention that diversity, not similarity of result, is attained. Our friend would not, we presume, wish the world to be deprived of the benefits of the aggregate mediocre intelligence that results from our schools because only a few of the more able distinguish themselves and take their natural place as leaders of men. If not, why should he tilt against the general results of teaching? They are the same under all systems, and in every department of knowledge — as various as the capacity of the individual pupils.

But "in teaching or learning Forestry," we are told, "the conditions are essentially different." "It is a thing that cannot be learnt by rote, and what would be correct practice on one particular site would be radically wrong on another." No one will deny the truth expressed in the latter sentence, but it is just this fact that to our mind shows the necessity for a Forestry School most clearly, and that the writer is wholly wrong in stating that "the conditions of teaching or learning Forestry are essentially different" from learning any other trade or profession. Forestry, we allow, cannot be learned by rote, but neither on the other hand can it be learned by empiricism. The latter is the system or school in which by far too many of our foresters have been taught, and in their laborious lives and often isolated positions it is little wonder if the ordinary incentives to take action and teach themselves the principles of their craft should have proved ineffectual. But we will be told there are plenty of accomplished foresters who would, with their exceptional opportunities for combining practical with theoretical instruction in their own fields of practice, be superior teachers to any that could be found in a Forestry School. Well, we do not attempt to deny that this might be so, were it not for several rather important considerations bearing, as we think, rather adversely against the possibility. The most powerful of these adverse considerations is the fact that few, if any, of the foresters that are qualified to teach the theory or rather the technical subjects which are essential to the right comprehension of the principles and practice of Forestry, have time to devote to pupils. Their multifarious duties fully occupy their time, and we fear their pupils would grow slack in their attention to subjects which could only be treated of in a desultory manner by the master.

EDINBURGH AS A SITE FOR A NATIONAL SCHOOL OF FORESTRY.

BY THE REV. J. C. BROWN, LL.D.

AMONG the more manifest advantages of Edinburgh as a site for a National School of Forestry may be mentioned the following:—Adjacent to the city is an arboretum purchased by the inhabitants at an expense, it is said, of £20,000, and presented to the nation in the hope that it might be utilized for the study of Forestry. Conterminous with this, and connected with it, there is a large well-equipped and well-stocked Botanic Garden, supported by the nation. In this there is a large comprehensive museum of all kinds of vegetable products. In the Museum of Science and Art maintained by the Committee of Council on Education, in close proximity to the University Buildings, there is a large and valuable collection of woods and other forest products, and well-selected specimens of illustrations of Mineralogy and Geology, of Entomology, Ornithology, and Mazology; a very large collection of articles exhibited at the International Forestry Exhibition in Edinburgh, and subsequently placed at the disposal of a committee, acting under the presidency of the Marquis of Lothian, is likely to be added to this so soon as contemplated additions to the building are made. There are numerous nurseries in the immediate vicinity of the city, and well-kept woods and plantations of easy access. There is an Arboricultural Society, a Botanical Society, and a Field-Naturalist Club, to the membership of all of which it is presumable students of Forestry may be eligible. Thither has gravitated the publication of *Forestry, a Journal of Forestry and Estate Management.* There, are resident the gentlemen with whom originated the idea, and by whom were carried out the arrangements for the late International Exhibition, and those who, from their known interest in the enterprise, have been commissioned to endeavour to secure the establishment there of a National School of Forestry. And there, are situated the head-quarters of the Highland and Agricultural Society—empowered to grant certificates of attainments in knowledge of Forestry.

In the University are taught the following subjects, by professors whose names are annexed:—*Mathematics*—Prof. Chrystal; *Natural Philosophy*—Dr. Tait; *Chemistry*—Dr. C. Brown; *Agriculture*—Prof. Wallace; *Botany*—Dr. Dickson; *Geology and Mineralogy*—Dr. Geikie; *Natural History*—Dr. J. C. Ewart; *Engineering*—Prof. Armstrong; *Commercial and Political Economy and Mercantile Law*—Prof. Nicolson; *Conveyancing*—Dr. J. S. Tytler; *Anatomy*—

Prof. Turner; *Surgery*—Prof. Chiene. In summer, tutorial classes for the study of Mathematics and Natural Philosophy are conducted by the assistants of the professors of those subjects, for students who have attended a winter course therein.

Means are afforded for practical instruction during winter and summer in the following subjects:—Practical Chemistry, under the superintendence of Prof. Crum Brown; Practical Physiology, under the superintendence of Prof. Rutherford; work in Physical Laboratory, under the superintendence of Prof. Tait; work in Natural History Laboratory, under the superintendence of Prof. Ewart; and in Herbarium and Botanical Museum, under the superintendence of Prof. Dickson. During winter—Bandaging and Surgical Appliances, under the superintendence of Prof. Chiene; work in Mineralogical and Geological Laboratory and Museum, under the superintendence of Prof. Geikie. In the summer—Practical Botany, by Prof. Dickson; Vegetable Histology, by Prof. Dickson; Practical Natural History, by Prof. Ewart.

In the Watt Institution and School of Arts, provision is made for the instruction of classes in Chemistry Theoretical and Practical, Natural Philosophy, Mathematics, Arithmetic, Engineering, Architectural, Mechanical, Geometrical, and Machine Drawing, Sanitation, English Language and Literature, History, Animal Physiology, French, German, Agriculture, Botany, Geology, Biology, Freehand Drawing, Bookkeeping, and Writing.

With such provision for preparatory and accessory instruction, all that is further required is provision for professional studies. These may be classed under the following heads:—

Part I.—

Forest Botany, embracing the structure, physiology, scientific classification, and natural history of herbs found in woods, and arborescent shrubs and trees.

Forest Pathology, or diseases, and the natural decay and death of trees.

Forest Mycology, or natural history of fungi found in forests, and of fungi injurious to trees and timber.

Forest Entomology, or natural history of insects injurious to forest products.

Forest Ornithology, treating of birds injurious or beneficial to the forests.

Forest Mazology, treating of quadrupeds, etc., injurious to forests.

Part II.—

Destruction of Forests by Man.

Forest Conservation in France and in Germany.

History of Forestry.
Advanced Modern Forest Economy.
Sylviculture in accordance with the Advanced Modern Forest Economy.
Forestry of different Countries on the Continent of Europe.
Forestry and Arboriculture of Britain.
Improved Forestry in India.
Treatment of Forests in British Colonies.
Destruction, Conservation, and Extension of Forests in the United States of America.

There exists in this country an opinion that a School of Forestry should be located in a forest, or the immediate vicinity of one, that the students may have constant opportunity of witnessing and of taking part in forest work. A like opinion prevailed on the continent when Schools of Forestry were first organized, but it is otherwise now. In an article entitled "Opinions of Continental Foresters on the Location of a School of Forestry," which appeared in the *Journal of Forestry*, in the consecutive numbers for March and April 1878, I have shown that the prevalent opinion now is in favour of having such schools connected with universities or other like institutions.

In some of the Schools of Forestry on the Continent, the students remove with their teachers to some forest at a distance in spring, and spend the summer in practical work. I do not anticipate any difficulty would be experienced in finding foresters of established reputation to supply practical instruction in the forests under their charge to students who are able to avail themselves of such an advantage; nor is it impossible that satisfactory arrangements might be made for such practical training being obtained in some of the Crown forests in England.

By Mr. Mackenzie, superintendent of Epping Forest, under the Corporation of the City of London, there was submitted to the Epping Forest Committee of the Court of Common Council in 1881, a memorial, in which he unfolded a scheme for the establishment of a School of Forestry in connection with that forest. There appears little probability of effect being given to his suggestion. But there is one point in regard to which he makes some important statements, of which advantage might be taken in endeavours to secure practical training for students who have no access to forests in Scotland in which to gain a knowledge of the practical work in which they desire to engage.

Writing to the Epping Forest Committee of the London Court of Common Council, he says: "You possess about 6000 acres of land all more or less forest, neglected, detached, and inharmonious in effect by reason of its having been, from circumstances well known to you all, so very much subdivided, that an effort must be made, as soon as the outlying portions are restored to your care, to blend them all into one harmonious, albeit diversified, whole; consequently the land must be carefully surveyed, and mapped out accurately, in order that a reliable plan may be obtained on which to work out a scheme which may guide the conservators of the forest for all time; and, lastly, that much planting, and the careful thinning and pruning of existing trees, must be judiciously prosecuted for many years." It is added: "The execution of all these works would form the best possible groundwork for the practical training of the foresters in the future." And in the programme of study which he submits, he says: "If the course of study should extend over four years, the first two to be spent at Epping Forest, where the trees have been neglected for so many years, it will be the object of the staff to organize order, and produce regularity out of disorder and chaos; the third year should be spent in the New Forest, which is a tract of sufficient extent, having over 60,000 acres, and which, having been in Government keeping, may be supposed to be a farther advance and development of the principles pursued by the student during his first two years at Epping; the fourth year should be spent at Windsor, where may be seen the full development of the principles commenced by the student at Epping. After this course of training, those pupils who have diligently applied themselves to their studies during the four years should be drafted off to other fields of usefulness, either at home or abroad."

Should it be deemed desirable, as I think it is, that provision be made for still higher or more varied training being given to a select number of the more promising students, the desideratum can be met. In more than one of the most celebrated Schools of Forestry on the Continent, provision is made for the attendance of foreigners, and these enjoy all the educational advantages of the alumni on specified terms. Assuming that the teacher of Botany—if there be but one—or one of them, if there be more, be qualified by knowledge of the language spoken, such advanced students might be sent under his direction to attend at one of these continental Forest Schools a summer session; and possibly permission might be obtained from the same or some other School of Forestry for the British students to accompany the students of the country on their autumnal excursion, and to take part with them in the forest work, to the great advantage of teacher and taught, and through them of the country at large.

When in the beginning of 1883 it was resolved to make arrangements for an International Forestry Exhibition being held in Edinburgh, it was announced that this was done in the interests of Forestry, and to promote a movement for the establishment of a National School of Forestry in Scotland. In the address delivered by the Marquis of Lothian in opening the Exhibition, prominence was given to the importance of this object.

In an Appendix to the Report made to the Executive Committee of the Exhibition by the Jurors of Forest Literature, was an Addendum in the following terms:—

INTERNATIONAL FORESTRY EXHIBITION, 1884.—CLASS VI.—REPORT.—ADDENDUM B.

The jurors of Class VI. beg to submit for the consideration of the Executive Committee the following communication, and as it is beyond the scope of a Report on Forest Literature, they prefer to forward it in the form of an Addendum:—

At the meeting held in Edinburgh on the 28th of March 1883, to initiate arrangements for an International Exhibition of Forest Products, one of the chief reasons advanced for holding such an Exhibition was that it might promote a movement for the establishment of a National School of Forestry in Scotland.

A perusal of the literature and an examination of the working plans of forests and of forest survey maps, etc., have impressed the jurors with the fact that in most countries of Europe, in India, in South Australia, and even in Japan, Forestry as a science is receiving greater attention, and bringing about larger economic results, than in most parts of the United Kingdom; and while it may be presumed this Exhibition will give a stimulus to planting in Ireland, and in parts of England and Scotland, where, owing to the poorness of soil, and other difficulties in making farming remunerative, it would be very important to have an institution where the foresters of the future may receive a somewhat similar training to that now given to the young men selected for the forest service in India, and without having to go abroad to obtain it.

How and where such an institution should be situated, the jurors do not venture to recommend, but they would with deference suggest that before the close of the Exhibition a conference be held to consider the subject in all its bearings. They believe if practical training could be obtained within an easy distance of Edinburgh, the theoretical branches of instruction in Scientific Forestry might without difficulty be obtained at existing institutions in the city itself, and at no great expense; and they see no reason why the experiment of Forestry Classes should not be attempted without delay.

(Signed) P. DODS, Colonel, *Chairman.*
JOHN C. BROWN, LL.D.
A. W. BELFRAGE, C.E.
P. NEILL FRASER.

EDINBURGH, 22*nd August* 1884.

In accordance with this suggestion such a conference was held; and a committee was appointed with powers to act. Instructions were not formally given to them; but it was submitted that if a permanent museum of forest products to be formed of articles presented by exhibitors for this purpose were combined with the Museum of Science and Art in Chambers Street, this would be a great saving of expense, and provide for its being extensively useful through its being easy of access; and that something should be done at once, on however small a scale, to commence instruction in Forest Science in the immediate vicinity of Edinburgh, and both suggestions were received with applause.

The committee have done all that is practicable towards carrying out the first of these measures; but they found the second beyond their power.

Within a fortnight there was made to the convener of the committee an offer of a course of lectures on Forest Science, comprising thirty-five on Forest Economy, forty on Sylviculture, twenty on Forest Botany and Zoology, and five on the Professional Training of Foresters, one hundred in all, commencing at the same time as the winter session of the University, and to be delivered at such place, such hour, and on such terms as might be agreed upon. The lectures to be followed by examinations on the subjects discussed. But nothing came of this in consequence of want of funds.

In spring a similar offer of lectures to be delivered during the three months of the summer session of the University was made; but nothing came of it, in consequence of continued want of funds.

No time had been lost by the committee in advertising the resolution of the public meeting and soliciting subscriptions towards the expense of providing for the permament exhibition of the articles entrusted to them, and for the establishment of a lectureship or professorship of Forest Science; but the response was not such as would warrant them to proceed without a great addition to the funds placed at their command, and in summer a second appeal was issued.

In view of this, there was received by the committee an offer of twelve lectures of a popular character on subjects of general interest, which might be supposed likely to bring the enterprise into notice, and increase the interest taken in it. But again the reply was: "No funds." And thus the year has passed without its being in the power of the committee to carry out the second suggestion submitted and approved by the meeting at which they were appointed.

But the committee do not despair of the major scheme for which such temporary arrangements could only have been subsidiary, and were only designed to be so, being effected; and again they have made arrangements for bringing the matter under the consideration of all whom it may concern.

What is desiderated, and what is contemplated, is a *National* School of Forestry. There are British Colonies in which scientific educated foresters are employed; but it is only in India that there exists within the British dominions a continuous demand for the services of such. Hitherto the preparatory training for this service has been an expensive one—expensive to the aspirants, being prosecuted largely in France—and expensive to the State, a large proportion of their expenditure being refunded, on satisfactory testimony being supplied in regard to the attention given by them to their studies, and a considerable expenditure being incurred in the superintendence of their studies. But the results have not proved satisfactory.

Mr. W. G. Pedder, revenue secretary, India Office, in giving evidence before a Select Committee of the House of Commons in July last, it is reported, stated, in regard to candidates for employment in the Forest Department in India: "It was found that the young men sent to France were not sufficiently well acquainted with the French language to acquire knowledge through that medium. A change had consequently been made. The young officers selected were sent to undergo a course at the Royal Engineering College at West Hill, where they were instructed in the ordinary engineering education, and in addition were taught Forestry, and Botany, and Forest Law, and Jurisprudence. . . . No applications had been received from other than the Indian Department; but no doubt other students would be received, who would pay the fees of £180 a year, including everything excepting pocket-money" (see *Forestry*, 1885, p. 310).

At much less expense than this, then, might be provided in Edinburgh, education, instruction, and training, equal to what has hitherto been given to candidates for appointments as forest officials in India; and such, it may be assumed, would suffice for candidates for similar appointments in our Colonies and at home. In the former, importance is attached to the social position and social training of the aspirant being such as to qualify him for administrative duties; but the capability of attaining administrative ability with a corresponding professional preparation, is not confined to the sons of such as can meet the expense of the more expensive training; and there are multitudes of young men whose services it would be advantageous to the community to secure, whose parents cannot expend on their training £180 a year, who at such an institution as is contemplated might be prepared for any competitive examination which might be proposed by the Government; and who thereafter might be left to create their own social position, with the probability that they will rise high in the service, and command respect and esteem.

There are three arrangements, by any one of which the advantages to be derived from selecting Edinburgh as the site of study might be secured at a moderate expenditure: 1. The creation of a professorship of Forestry or Forest Science in the University; or 2. The creation of a lectureship on Forest Science in the Watt Institute; or 3. The creation by the Science and Art Department of the Committee of Council on Education of a School of Forestry in Edinburgh similar to the Royal School of Science in Dublin, and to the Royal School of Mines and Practical Geology in London.

The committee are as nearly unanimous as it is possible to be in opinion that the first of these arrangements is in existing circumstances preferable to either of the others; and they are perfectly unanimous in opinion that this is what should first be attempted, and to provide for this they are directing their best energies.

TREES OF MONMOUTHSHIRE.

BY "YOUNG FORESTER."

THE ELM.

THE Elm grows in great abundance all over the moors of this county, and the timber is of a much tougher sort than that of many parts of Gloucestershire and Somersetshire; but it does not reach such large dimensions here as in these other counties. I have known in my time very large elms felled on these Monmouthshire moors, containing from a hundred to a hundred and fifty cubic feet in their bole. We do not usually get them so large; nevertheless there are hundreds of trees still standing with an average of 50 cubic feet each, which I consider at the present time a very saleable size. Elm with a girth of 12 inches and upwards realizes upwards of 1s. 2d. per cubic foot, and under 12 inches 8d. to 10d. delivered in Newport. The soil of these moors is principally a blue clay, but here and there is found a dark loamy clay, also a red loamy clay where the land is more elevated. Although the elm grows so plentifully on the blue clay, it does not seem to thrive as well as in soils of a dark or red loamy nature. I should recommend planters of the elm in this county to plant deep loamy soils on gravel or sandstone with it only, and by preference only where there is good shelter.

There are some very fine elms growing at Wonaston, near Monmouth town, also in and around the neighbourhood of Newport. There is one very fine old specimen at Raglan, in the castle grounds. The fine old monarch standing in Llantamam churchyard, now in a state of decay, is not the largest, but it is one of the oldest in our county. The trunk is a mere shell, being hollow, and one side having been carried away by a storm; the top also is completely gone. As it stands, the bole is 9 feet in height by 24 feet in circumference at 5 feet from the ground; but before the missing side was blown away, it may have been quite 35 feet in circumference at that height. There are three limbs still attached to the trunk, which extend from 15 to 20 feet, and which still bud and produce a fair flush of foliage every spring.

The Wych Elm (*Ulmus montana*) grows well in many parts of this county, the timber of which makes very good shaft plank when clean and free from knots. I find the Wych Elm flourishes best in a good deep loam, and rapidly reaches valuable dimensions.

PRUNING EVERGREENS.

THE pruning of evergreens is often much neglected, no doubt from a variety of causes, but certain it is the practice is more honoured in the omission than in the application. Plantations are made, and we are in haste to see results as early as possible, consequently we withhold the knife in the early stages of progress. We cannot bear to shorten back growth even for the purpose of improving the base of the superstructure of the future shrub or tree. As for trimming an over-luxuriant branch in order to balance the sides of a promising specimen shrub or tree, why, such a thing would be so much waste of growth. And truly so it would be, because such an unequal development of growth as is imagined in this case, should never have been allowed to make way for a whole season. It should have been pinched back as soon as it was observed in the early part of the season; but having been left, there should be no hesitation in cutting it back before the commencement of another season of growth. We certainly have not improved much in our time in the matter of pruning evergreens. We do not, it is true, cut and curve any that are amenable to that treatment into the forms of peacock's griffins, and so forth: that barbarity has been cast away; but then we have not, on the other hand, taken up any progressive course.

I hold that ornamental shrubberies should be regularly and systematically gone over with the knife and pruned. The peculiar character and habit of each sort ought to be carefully studied and preserved, not obliterated; but the true balance and symmetry of each individual should be maintained. In many of our most handsome evergreen shrubs and trees this is not difficult to do. The holly rhododendron, the various forms of cupressus and kindred coniferæ, and many others, want but little attention in regard to pruning. Their habit of growth is naturally symmetrical while young. For many years all they may require will be watchfulness to prevent their becoming lobsided by the growth of extra luxuriant side shoots or the development of competing leaders or central shoots. The upper part of such trees and shrubs as form the bulk of ornamental plantations are apt through neglect of a little timely pruning to extend so rapidly as to overbear and rot the lower portions, which are eventually overshadowed and die from want of light and sheer debility. This is particularly the case with hollies which are permitted to run upwards, and by and by getting beyond convenient reach their upper branches assume the form of trees, and are left with a feeling somewhat akin to despair to grow as they list. In a few years the lower branches die away, and it is then discovered that what might long ago have been prevented has become irretrievable. The hollies themselves, never designed by nature to become naked stemmed trees in full exposure to sun and air, ere long resent this treatment or rather want of treatment, and show every sign of weakness and decrepitude. The stem becomes bark-bound, the top dies away limb by limb, and the only remedy for the general unsightliness is to cut them over close to the ground and allow them to spring from the base, which they readily do if not too much debilitated, in which case they should be grubbed up and the ground replanted. It is futile to attempt to establish anything underneath hollies, which have been permitted to run away in the manner described, in the hope of furnishing the ground line with foliage. Scarcely anything will live and nothing thrive under a canopy of holly, though it is one of the best underwood plants itself.

Cupressus, Thujas, Retinosporas, and all similar coniferæ, have a tendency to become bare below in the course of years. But this may be prevented to a large extent by the moderate use of the knife on the upper parts of each plant. There should be no hedging in with shears, but a cutting out of over-luxuriant shoots bodily, yet not so as to affect the natural form and character of the plants. Competing leaders ought never to be permitted in such trees.

Rhododendrons are greatly benefited by timely and judicious pruning, yet it is no uncommon thing to meet with practical men who scout the bare idea of applying the knife to them. But it is occasionally the fate of such people, or of those who may have to deal with their errors, to be compelled to use the saw to remedy the effects of the neglect of the early and considerate use of the knife or the finger and thumb. How often do we see rhododendrons when planted for cover or undergrowth permitted to ramble in unrestrained wildness, with here and there a giant limb favoured perhaps with a little more light than the others springing from the same root or stem, and endeavouring to rival the stature of the trees overhead. It is waste to permit such growth to make undue headway, because it impoverishes the rest of the plant; it also frustrates the practical object in view, which is to produce undergrowth, and it is not generally necessary that it should be more than a few feet high. The timely use of the knife in all such cases would facilitate the development of lateral growth, which is just the thing wanted. I have in these remarks had the common pontic and other cheap varieties of rhododendrons used for covert and underwood planting chiefly in view, but they apply with equal propriety to the choice hybrid sorts which are more usually planted in ornamental plantations for the beauty of their flowers. Any irregularity of growth that may be permitted in these must destroy the balance that should subsist in each plant. It is easily prevented when it first manifests itself, but quickly works mischief when it is permitted to make way.

I need not pursue the subject with further examples. All that is needed is intelligent observation to detect and promptly check undue irregularity, and to keep a right balance of foliage on all parts of the individual plants, and in accordance with the natural character of each.

I consider the best time to prune evergreens is spring.

J. M'INTOSH.

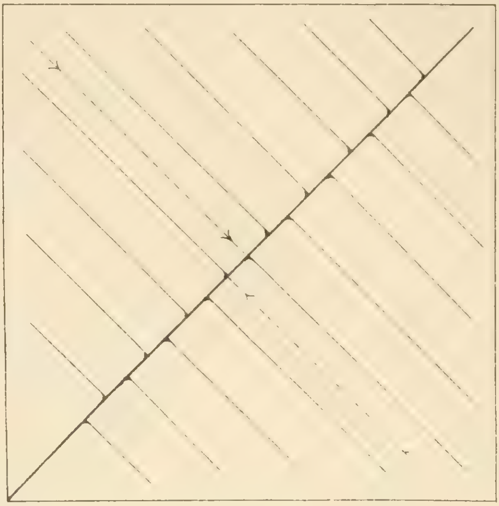

Fig. 1

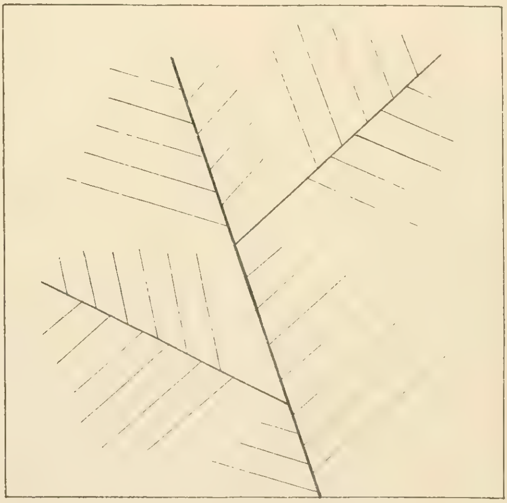

Fig. 2

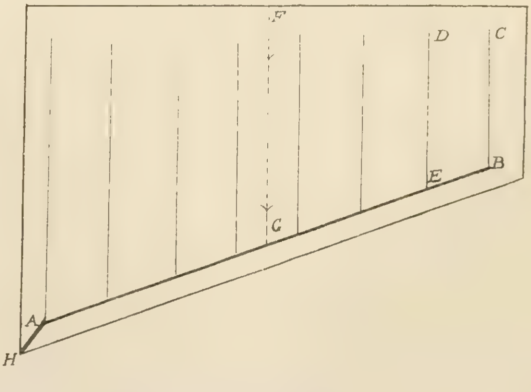

Fig. 3

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DRAINAGE OF LAND FOR PLANTATION PURPOSES.

IN preparing the following paper I am fully aware that the theories laid down, and the accompanying plans, introduce into the question no new feature, nor declare any novel principle. Nor are they intended to do so, for my endeavour is merely to bring together and condense some of the scattered information on the above subject, which is only to be acquired by a study of the collected writings of various authors, and which is in consequence inaccessible to many to whom a knowledge of it would prove of service.

The necessity for the drainage of ground intended for afforestation purposes is in these days very generally recognised, but the repetition of a few remarks by an eminent authority, setting forth the action of an undue amount of moisture in the soil, will hardly be considered out of place. He says: "The deleterious effects of water . . . may be explained,—in the freezing of the ground in winter in one mass around the roots of the trees, as long as they are young,—in obstructing the sun's heat entering the soil, and finding its way to the roots in the early part of every year,—in preventing the passage of the air to the roots of the trees, the presence of air being essential to their good health,—and the particular effects produced by all these causes may be witnessed in every tree becoming the victim of lichens and mosses, or other parasitic plants, or of being evidently stinted in its growth, or diseased in the interior of the trunk. The consequences are, the trees are a very long time of reaching a state of usefulness as timber or shelter, and can never realize the price of those grown on dry soil." And again: "The chief injury sustained by the soil is caused by the stagnation of rain-water upon an impervious soil. Most of the soil of Scotland consists of loam of different consistence resting on tenacious clay of unequal depth. Where the soil is shallowest it is injured by the stagnant water remaining constantly beneath it; and where deepest, it is injured by chilly exhalations."

In ground set apart for plantation purposes, it is not to be supposed that the whole extent will require to be drained: the chances are that only a small portion may call for it. An intelligent observation of the locality itself must be the sole reliable method of discovering the area or different areas where drainage will be beneficial.

Again, as to position and direction of drains, it is impossible to lay down fixed rules, as the ever-varying conformation of the ground demands ever-varying treatment, examples of the principal of which, with the help of a few plans, it is my endeavour to set forth in this paper.

Though a level may be of use in some cases to indicate the direction of the fall of the ground, the eye will, as a rule, be a sufficiently accurate test, and it may be useful to recollect in this connection that a fall of six inches in the course of a mile will create a flow at the rate of one mile per hour. In laying out drains, possibly much may be done in improving and straightening existing natural watercourses. Open or surface drains should without exception be employed, unless the crossing of a road or some such circumstance compel the construction of a covered conduit: covered drains through the body of a plantation are in every way objectionable. Those most generally made use of may be enumerated as follows:—Main drain—sub-main—minor or parallel—and spur, which is often of use in tapping the source of a spring, or drawing off the moisture from an isolated spot which the necessary regularity of the system employed has left untouched. A judicious combination of these four varieties will seldom fail to draw the surplus moisture from ground of the most irregular and complicated formation. As to the dimensions of a main drain, the largest amount of water ever likely to be carried into it from the slope, or slopes on either side, according as the case may be, must be our guide, but a main 36 in. deep, 12 in. to 18 in. wide at bottom with an easy slope, so as to prevent falling in and consequent destruction, will meet most ordinary requirements, though circumstances may demand a larger channel. At any rate it is wiser to lean to the side of over-capacity than the opposite extreme.

At the foot of a slope, or wherever a depression or hollow exists, with rising ground at one side or both (that is, supposing the neighbouring ground *requires* draining), a main drain should be cut. Now as to minor or parallel drains—which I take out of their order for convenience' sake. They should be formed up and down the face of the slope if it be a moderate one, but more diagonally if it be steep or at all precipitous, as otherwise the moisture will be drawn away too speedily, and will carry with it the most valuable particles of surface soil. Only the nature and dampness of the soil can direct us to their depth and distance apart, but in a clay soil a depth of 20 in., and width at bottom of 9 in., or in a lighter 14 in. and 9 in. respectively, will prove ample, while they should never be placed more than between 40 ft. and 50 ft. apart, or less than 15 ft.

Where slight hollows occur across the surface of a stretch of ground requiring drainage, striking the course of the main at a right or any oblique angle, a sub-main drain should be inserted, having a communication with the main. In size it should be a mean between

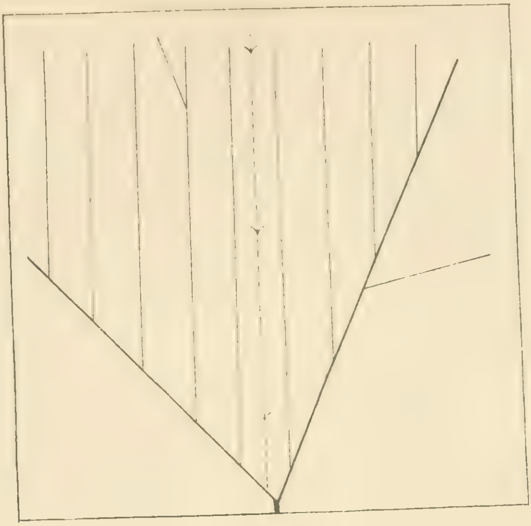

Fig. 1

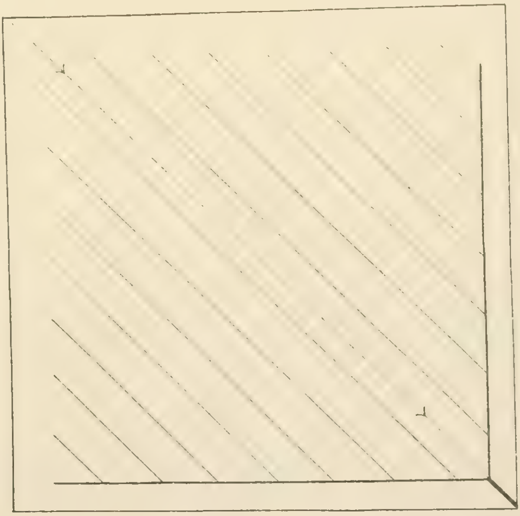

Fig. 2

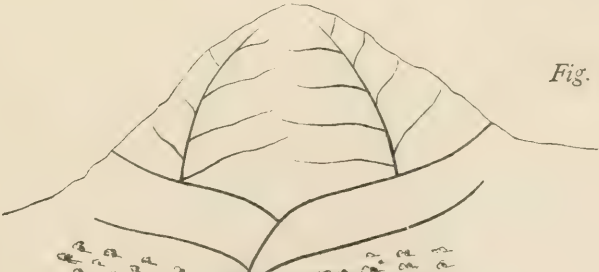

Fig. 3

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the last-mentioned and the minor, both as regards depth and width. As far as possible, all openings into the main should be made in the direction of the flow of the water, not at right angles to it; and such openings, should they be necessary at both sides, ought not to be formed opposite each other, but alternately. This, however, is more important in dealing with covered drains.

Fig. 1 represents what may be called "an area requiring drainage," with a moderate and even slope, indicated by the dotted line FG, and here the simplest and perhaps most generally employed combination is that of a single main AB, cut at the base of the slope, in conjunction with minors CB, DE, etc., falling into it at one side only. In every case the outlet AH should have a decided fall, and must be kept clear of weeds or other interruptions to the free egress of the water. At the point or points where surface water leaves the ground enclosed for planting, and enters covered drains, square openings in the fence, formed of large stones or mason-work, should be constructed. These should be supplied with strong gratings, not imbedded in the stone, but hung upon pivots, or a few inches of light chain: all danger of choking will thus be obviated.

In Fig. 2 the heavy line represents a main drain cut along the deepest part of a depression or hollow. Here again we have only to deal with main and minor drains (the latter indicated by fine lines, and the former by the heavy lines); but as we find rising ground on *both* sides, a double set of minors becomes necessary, opening alternately into the main. As in this case the fall at either side is supposed to be but a slight one, they have been drawn at or near a right angle to the main, as otherwise the incline would have been insufficient for the proper discharge of the water. This brings them into the main at right angles; but the objection to this is modified, or altogether obviated, by rounding off the outlets in the direction of the flow of water in the main (as shown in plan), which will thus assist in creating a current at the opening of each.

Figs. 3 and 4 show instances in which, from the "lie" of the ground, it is desirable to construct two main drains (again represented by broad lines) to receive the flow from a number of minors laid up and down an even slope. In the former area thorough drainage has been judged necessary; in the latter, only partial, those parts remaining blank being considered sufficiently free from moisture.

In these cases, further explanation seems unnecessary. Attention may, however, be called to a pair of the already mentioned spur drains (see Fig. 4).

We now come, for the first time, to deal with sub-main drains, instances of which may be seen in the two lines of medium breadth in the system represented in Fig. 5, in which main, sub-main, and minor are set forth.

Here the principal depression, let us suppose, is indicated by the broad line, and here the main must be constructed (as in the plan); and where hollows on a smaller scale occur, striking the course of the main, and forming an independent area or basin, the sub-main must be inserted, communicating with the main at a right, or more advantageously, an oblique angle. In this case, let us suppose that one of such hollows exists on either hand, as shown by the lines of medium breadth in the plan: these point out the direction of the sub-mains, into which minors are led in the same way as they have hitherto been shown to empty themselves into the mains only.

The volume of water thus collected is in its turn thrown into the main, and discharged in due course at the ordinary outlet.

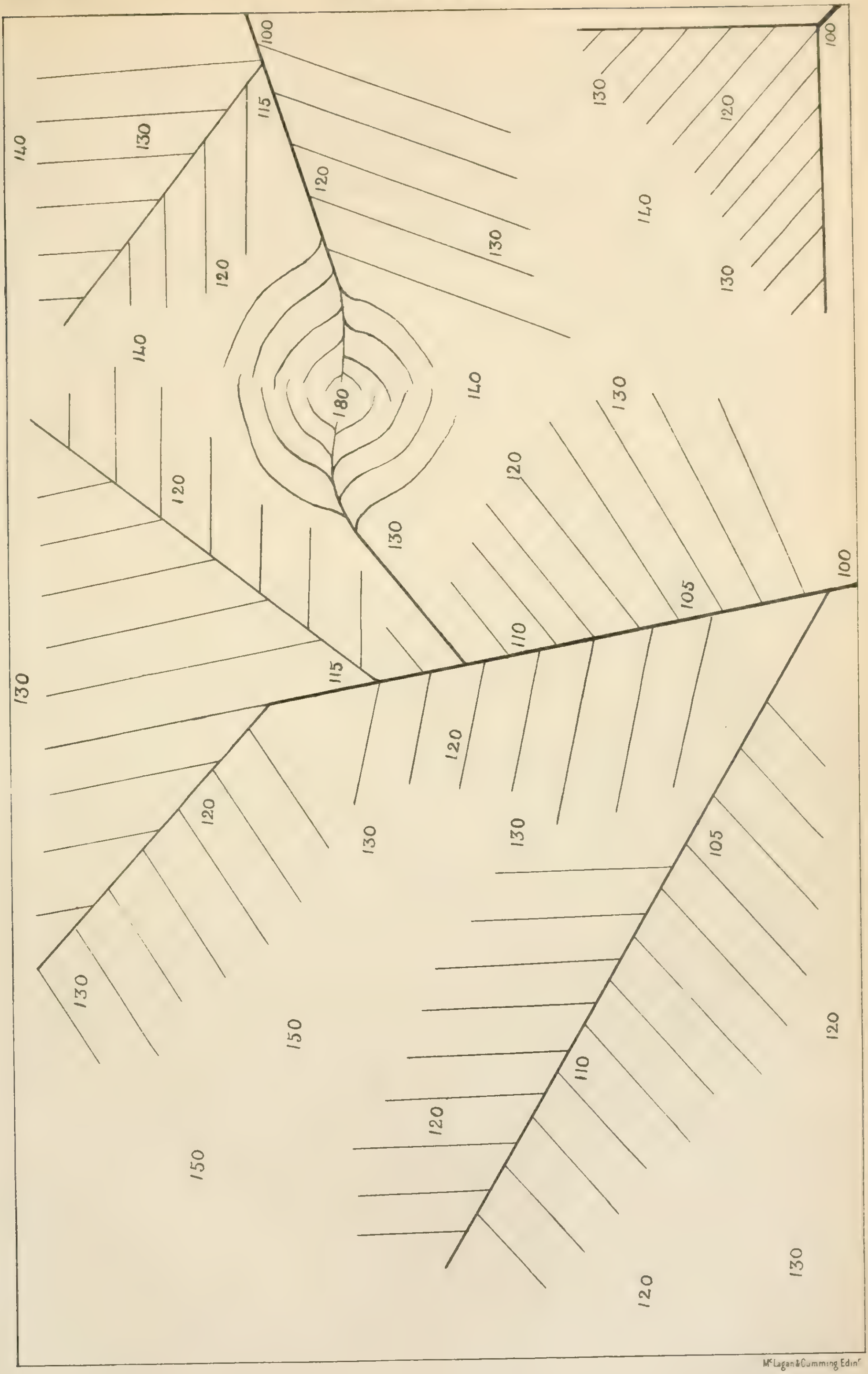
An example differing entirely from any of those already dealt with, is represented in Fig. 6. The method employed for surface-draining an isolated hill is here shown—a somewhat conventional hill no doubt, and which in nature would probably be free from excessive moisture; but exaggerated though it be, it will best serve that purpose as showing a specimen of the system which may be applied in more or less modified forms to ground of a kindred nature.

Here the minor or parallel drains cut across the face of the steep slope, and cannot fail to intercept and convey to the sub-mains, which in this case are cut vertically to the fall of the ground, such moisture as is not retained in the soil. These, as before, discharge themselves into the main drains (as in the plan), for which, in such ground, a suitable depression ought without difficulty to be found.

A combination of the different systems mentioned in the course of this paper is given in Fig. 7.

Here an area of considerable extent is dealt with, and one which, let us suppose, requires thorough drainage, happily an uncommon occurrence in such ground as that of which we now speak. For convenience' sake the lowest ground within this area has been taken at 100 ft. above the sea-level, ranging to 180 ft. at the highest point, the intermediate elevations being indicated here and there by figures; and it will be easily seen that ground of such conformation necessitates the division of the whole into various drainage areas or basins—six in this case. As to the outlets, convenient points must be selected, each one of course at a lower level than the deepest part of any drain belonging to its own particular system. In other words, the elevation of the outlets vary according to the elevation of the areas to which they appertain.

Here three such outlets have been found sufficient, each of which, for the sake of simplicity, has been put down at an elevation of 100



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feet. These, being fixed points, may, or must, to a certain extent, influence the direction of the drains composing each system ; at the same time the rules laid down must be as little as possible deviated from.

One more example calls for attention. On boggy or marshy ground a deep depression, with rising ground on all sides, will often be noticed, which, from the impervious nature of the subsoil, retains the surface water that flows into it. Possibly it may prove of service as a receptacle into which to turn the surplus drawn by means of drains from higher or the surrounding slopes, and, if it assume the dimensions of a pond or small lake, may be left with advantage—a thing of beauty, and probably a delight to the sportsman's heart.

Should it, however, be thought desirable to draw off such a collection of water, the chances of success depend in a great measure on the existence of a stratum of gravel or sand not unfrequently to be found underlying the clay bed which is, almost without exception, the support of a moist and boggy surface.

Having discovered by boring with a fine augur the existence of such a stratum, the most economical plan is to bore holes in the first instance through the clay, with an augur 6 in. in diameter ; and, should the water subside, to finish the work by sinking wells through the clay and filling them with small stones.

The surplus water that is drawn by means of drains from moist ground intended for plantation purposes need not necessarily run to waste. It may be utilized in forming the boundaries of the plantation ; may be stored to supply motive power for a sawmill, or made use of for irrigation work, etc. At the same time it must be remembered that in many cases, after a certain period, drains will have done their work, the moisture which freely entered them formerly being drawn away and absorbed by the ever-spreading roots. In conclusion, I give a well-authenticated example of the power of the roots of established trees to dispose of superfluous moisture in the soil :—" It may be observed as an instance of this natural drainage, that an artificial pond, made . . . about twelve years ago, which was at first fed to overflowing by drainage water, was ultimately dried up as the growth of an adjoining plantation of mixed coniferæ continued, owing to the greater root-absorption of the water which formerly fed it. Many other instances of marshy ground that has been rendered quite dry by plantation of Scots pine are on record.

R. E. HODSON.

THE LIBERTON MAINS NURSERY.

NOWHERE better than when scanning the glorious landscape from the Queen's Drive, just beyond Samson's Ribs, is the visitor reminded how recent municipal extension has brought more prominently into notice historic localities far apart from the erst single street and surrounding closes of old Edinburgh, but inseparable links in its civic story. Craigmillar Castle and Blackford Hill, despite modern villas built around them, will always speak of Queen Mary or King James. Citizens' trim lodges are massed close in the valley towards the New City Park, which will soon be thus environed; and, indeed, the pedestrian must all too soon have to travel another mile south ere he skirt the country; Liberton appears to stand even now on one of the hills constituting the special beauty for situation of the northern metropolis. Yet, amidst all this building extension, sylviculture has contributed a living leafy testimony of the past, once thought by old Edinburgh residenters to be amongst their buried memories associated with Craigmillar Castle. Queen Mary's sycamore, as well as her thorn, have disappeared during the last forty years. But young seedlings from the sycamore now thrive in Liberton Mains Nursery, on the slope of that hill, close to where, on its summit, stand the old Castle ruins. Mr. Gladstone added fame to the system of market gardening pursued on the farm, when exhorting distressed agriculturists to begin strawberry culture. And now it has to be entered in the notabilia of the arboriculturist during an Edinburgh visit, as the site of a new point of departure in the progressive practice of the art, by a firm dating previously to 1770. Messrs. Dicksons & Co. have added this new establishment to their other nurseries at Redbraes, Logie Green, and Bonnington Farm. They have thus enhanced their old reputation as educational horticulturists. For Loudon worked in their old Leith Walk nurseries. And despite the non-establishment of the Scottish Forest School, young arborists will find at Liberton what is practically an experimental station, where, like young engineers, ere cared for by University professors, they may learn by practical example.

Liberton Mains comprises nearly four hundred acres, only part of which are occupied by the nursery. But this cheap rent and large area allow features of arboricultural practice being expressed in a larger and more effective manner than, say, at Bonnington, where Edinburgh nurseries most do segregate. Seed-testing, usually confined to a few yards, is here done in plots of several acres. One such compartment of cabbages had in summer the appearance of a large field of healthy stock, but so carefully had plants for true seed been selected that not one-tenth remained at the time of our visit. Further, the firm find here scope and verge enough for the system so long practised in their Pilrig and other Edinburgh nurseries, of planting new breaks of forest trees and other seedlings on land which has been first under some cereal or other green crop, and never previously under trees. Liberton Mains is at least three hundred feet higher in altitude than the nurseries in the Leith Walk district of Edinburgh, and its temperature is at least 3 degrees to 4 degrees more extreme. But Arthur Seat and the other monuments of the Cyclopæan earth-throes, which originated the hills on which Edinburgh is built, and scarped the romantic landscape which roused Scott's poetic fire, act as protecting walls against those east and north winds, the bane both of delicate plants and invalids in Edinburgh. The site has thus been found specially suitable for rearing roses whose stocks could only previously be obtained from England and Ireland. The apples raised on it were exhibited at the late Edinburgh Congress, and indicated an amount of sunshine which compared favourably with the fruit grown in the south of England and Ireland. In time the arboriculturist may rely on plant growth prognostications just in the way the sanitarian consults the vital statistics of our great cities. Such records, in their connection with weather changes, have been diligently studied at more than one centre on the northern slopes of Edinburgh; but scientists appear only to agree on the unreliability of the yet imperfect observations in forecasting plant growth. It may suffice, meanwhile, to note that while the Glory pea (*Clianthus puniceus*) sickens around Bonnington, it luxuriates at Liberton. The clear air of the latter locality carries no stratum of city smoke, which is all too evident in scanning the northern horizon of Edinburgh. Its high exposed situation and sharp sandy soil satisfy the conditions postulated some years ago to the Botanical Society by the late William Gorrie as necessities for the healthy growth of forest conifers. So this nursery presents the two unique features of a training place for orchard trees, or fruit-bearing hedgerows, as well as future tree covers of highland mountains.

The fruit tree and forest tree departments of the nursery constitute its two divisions, apparently affording attractions to distinct classes of purchasers. But a thorough inspection of both demonstrates closer bonds. Thus the perfecting of a market garden system of agriculture must always interest foresters who are usually estate improvers. Then, seed growing true to stock, must always be a burning question in such a connection. And what more pressing question than improved hedgerows, at once affording shelter, profit, and beauty? The rows of young apple trees, 6 or 7 feet high, planted some 60 yards apart in the strawberry breaks, attract passing travellers in the Dalkeith omnibus in the early summer by the novelty of their mass of blossom. Why should not the reproach of high walls shutting out the landscape from the passing visitant, and grievously complained about, as specially discordant to the surroundings of this neighbourhood, by more than one Canadian, be thus pleasingly done away? Has the moral training of British homes and School Boards yet to be distanced by the known practice of Japanese and German urchins who walk daily through such rows without touching the fruit? But an object of thus exhibiting such hedgerows is to show that shelter and profit may be thus simultaneously attained even now in the more secluded parts of an estate. The apple plants were mostly pyramids, of the best hardy growing sorts, at six years' growth of a corresponding height, and so richly laden with fruit last summer, that some of the branches broke. Indeed, the display of the yield of fruit exhibited at the late Apple Congress in Edinburgh was thoroughly true to nature. Of course the orchardist may also here consult his taste, though that be finical, as to species and varieties as well as shape in the six acres or so devoted to young stocks, which are here reared true to seed, and usually then taken to a larger collection at Pilrig and elsewhere, so that cordon and wall training may be practised. But even here standard apples alternate with pyramids, while Victoria plums and other different varieties are interspersed. Pears are not so thriving a crop as in Lanarkshire, though lines of the "Fair Maggie," a Clydesdale favourite, are grown in this orchard. Amongst other notable fruits observed at Liberton were three acres of rasp canes, six years planted, including the Prolific, Fill-Basket, and Baumforth; many thousand true gooseberry stocks interspersed with currants of various sorts; celery, and rhubarb, besides the strawberry plots from which the place has gained political fame. Amongst other seed tests of field crops, some acres of Gibson's Drumhead cabbages looked very healthy. But the display of rose stocks, of which there are nearly 26,000 budded and unbudded, will always be a prominent attraction to the visitor. Plants of varieties, which when brought from the south of England sickened and died in Edinburgh in severe winters, if reared in this nursery stand well through our northern winters.

In the forest tree department the larger available space allows interlining to be prosecuted with great benefit to the growing seedlings. After a first year's planting, from seed or otherwise, only every second row of plants is taken out, thereby allowing those left freely to develop root growth, which is further hastened by agitation of the surrounding earth by the spade so as to give thorough aeration

Next season they are again transplanted, or they may be left for two years, when they are again interlined so as to encourage stout roots and clean healthy plants. Purchasers may thus see that it is more profitable to buy forest seedlings by age rather than height. In the same field were strong one year's old transplanted Tyrolese and native larch, 4 feet high and over, and large breaks of Scotch fir five years old thrice transplanted, not higher than 12 inches, but with a greater root growth, admirably adapted, as shown by their present site, for steep hill slopes. A large area of oaks over a foot high, raised from a ton of acorns, testified to the seed-raising capabilities of the spot. So, too, did great breaks of young larches, native Highland pine, spruce, oak, sycamores, beeches, as well as various kinds of recently introduced varieties.

The other nurseries of the firm, specially that of Redbraes, are replete with novelties worth attention during the planting season. Amongst the specialties in ornamental shrubs and trees may be noted fine specimens of *Prunus Pissardii,* the rich leaf-coloured *Acer Hookeriana,* a golden weeping ash, and several Japanese novelties which appear well suited to our northern climate. The large breadths of hollies, rhododendrons, tritoma, and mahonias afford an admirable selection for game covers. The relations betwixt Bonnington and Liberton thus help towards the full development of sale plants, enabling the purchaser to obtain ornamental and forest supplies from the same establishment. The central warehouse in Waterloo Place has telephonic communication with all the nurseries.

A. T.

EFFECT OF RED LEAD, CARBOLIC ACID, AND PETROLEUM ON GERMINATION.

BY DR. A. CIESLAR, OF THE IMPERIAL AND ROYAL FOREST LABORATORY, VIENNA.

(Specially translated for *Forestry* from *Centralblatt für das gesammte Forstwesen.)*

EVERY year a considerable quantity of forest seeds is used in ordinary course. A great part of it goes into the nursery, to be there raised with care into good plants. The making and maintenance of nurseries is as a rule attended with great expense, and there are even cases in which the whole forest business is in the closest dependence on good management of the nursery. It is thus easy to be understood that foresters have ever endeavoured to render the raising of nursery plants as much as possible independent of artificial production and watching. Quite recently J. Booth, after testing, recommended the colouring of seeds with red lead (Pb_3O_4) as an almost infallible protection against birds and mice. Others recommend carbolic acid, and there are others again who prescribe the cheap protection of petroleum.

In Forestry literature numerous notes are to be found on red lead and its working as a protective means; but as to its effects on the seed itself and on the progress of germination, we have as yet only scanty and scarcely trustworthy information. A similar reservation has to be made in a still higher degree with the references to carbolic acid and petroleum. Now, it is of the highest importance to know, whether the substance to be applied has an injurious effect on the seed, or whether it leaves it quite unimpaired, before we recommend it at all. We have, therefore, undertaken by numerous experiments to obtain the answer to this question, which of itself and by itself ought to be a simple one.

Before proceeding to present the results, it may be well to explain in few words the preparation of the experiments. In tests of germination it is always necessary to aim at the greatest possible simplicity without diminishing the trustworthiness of the experiments. We used in almost every case Nobbe's germinating apparatuses, with which we happened to be provided. Some of them by way of trial at the commencement of the experiments were filled with fine earth, carefully levelled, and on this the seeds were sown. The consequence of this method was an extraordinary success. The seeds did not become so mouldy as on the clay, they found themselves in a germinating bed closely adapted to their nature, the moisture was on the level surface more equal, and the method itself cheap and simple. This method was adhered to for almost all the experiments on germination.

1. *Experiments with Red Lead.*—The measures recommended by J. Booth for colouring the seed with red lead have called forth in recent years a long controversy. Booth himself invariably observed a very good effect from the colouring. Oberfoerster Gruetter, of Elbingerode, in the Hartz district, applied this method to spruce fir seeds with the best results. Gruetter observed that the finches took some of the coloured seeds; but soon thereafter they left the seedbeds with signs of discomfort, and did not return. Finally, in the garden of the Neustadt Forest Academy extensive experiments were carried out by von Alten on the effects of red lead, which were accompanied by the most favourable results. There is now a complete saving of the expense of watching, which amounted to between

60 and 70 marks (£3 to £3, 10s.) every year. On the other hand, Oberfoerster Riedel announces his experience of the uselessness of red lead as a protection against birds.

Booth ascribes the want of results, observed by Oberfoerster Riedel, to the process of the colouring. A too slight coating with red lead seems not to save the seeds from the birds. Booth colours the seeds in the following manner. He moistens them slightly, but as equally as possible, with water, and pours red lead upon them. He stirs them and shakes them until they are all completely red with the colour of a boiled lobster. Von Alten stirs, in the vessel in which the colouring is to be done, a thin mixture of water and half a kilogramme of red lead. He pours 7 kilogrammes of seed into it, and on to the seed he sprinkles another half kilogramme of dry red lead. The vessel is then shaken until the seeds are equally coloured. The drying lasts about two hours. The following method we have found to be the best for colouring. In a broad vessel a mixture of water and 1 kilogramme of red lead is kept stirred, the mixture being not too thick. Into this 7 to 8 kilogrammes of seed, in portions of 2 kilogrammes at a time, are shaken, the vessel being kept continually in motion. Each succeeding portion of fresh seed will not be added until the previous portion has been equally coloured. The colouring is completed when a few seeds thrown in take on no colour. The red lead which adheres as a slimy coating to the bottom of the vessel must be scraped off with a wooden spoon and mixed with the seed. The seeds require no special drying: they are ready for immediate sowing, and will not form into balls. The price of red lead is on an average about 9d. per kilogramme, so the cost of colouring a kilogramme of seed comes to be about 1½d., including manipulation.

Regarding the effects of red lead as a preservative against birds and mice, no experiments have as yet been made by us; but accounts received from various quarters give a prevailing sound in its favour as a preservative. It seemed, however, to us not unimportant to test the effect which red lead exercises on the seed itself and on the progress of germination. The more so, as opinions on this subject are divided. Booth has remarked absolutely nothing on any influence of red lead on germinative vitality or on length of time in germinating. Neither has Riedel made any observations on this head, though it may be gathered that " the coloured seed-corns germinated more slowly on the nursery beds." According to Humboldt, the seeds appeared to germinate well, the red lead being rich in oxygen.

Our experiments taught us in the first series that the red lead delayed the commencement of germination about one day. Further, it is to be seen that the force of germination is in a slight degree weakened by the red lead. Notwithstanding these slight influences which cannot properly be called favourable, the seeds coloured with red lead afford almost always an equally high percentage of germination as seed in its normal condition. Accordingly, when once the protective power of red lead shall have been placed beyond all doubt by exact experiments, there will be no reason why any forester should hesitate to employ it as a preservative against birds and mice. From the numerous experiments was also to be observed that the coating of red lead is able to preserve the seeds a considerable time from mould fungus. When normal seed in the germinating apparatus is thickly covered with blue mould, there is no fungus to be observed on the coloured seed, nor for a long time after. It is not until the later stages of the experiments that mould growths appear also on the coloured seed.

The reason of the delay and diminution of the intensity of germination is doubtless to be sought in the increased difficulty of swelling. This has been proved by experiments in which the seeds were carefully weighed. For example, in one experiment it was found that coloured seeds took up 6·78 per cent. less water in the course of two days than uncoloured.

2. *Experiments with Carbolic Acid.*—Seeds were also treated with carbolic water containing 1, 2½, 5, 7½, and 10 per cent. of carbolic acid in numerous experiments. A general rule may be deduced from them, that the greater the proportion of carbolic acid, the more unfavourable is the effect of the solution on germination. A treatment of spruce fir seed for 40 minutes with water containing 10 per cent. of carbolic acid proved absolutely deadly to the seed, and a similar result would be experienced with all the other more important conifers, except the larch. Larch seed is so thick-shelled and resinous that it can suffer a lengthened treatment with carbolic acid without taking any great harm.

The experiments taught, that weak carbolic water containing 1 per cent. of acid, applied to the seed for half an hour, was permissible—that is to say, if further experiments should prove that such a treatment really preserves the seed from moles and mice, which there is already reason to doubt.

3. *Experiments with Petroleum.*—In numerous experiments petroleum destroyed from 70 to 90 per .cent. of the seed. It seems to have a direct and absolutely deadly effect on the seed. From all our experience we must give the most decided warning against attempting to use petroleum for saving seeds from mice and birds.

THE BIRCH.

COLERIDGE calls the birch, our British species (*Betula alba*), the "Lady of the Woods." That the poet's name for this beautiful tree is very apt, all will allow when it is applied to the more graceful weeping forms. Anything more refined and beautiful than a well-developed specimen of the silver weeping birch cannot be found among British trees. But it is also a most useful tree, being applied to many economical purposes, as well as having a high repute for some of the more refined objects of life. It is further one of the most hardy trees known, has the widest geographical range of any of our forest trees, extending from Lapland to the sub-alpine districts of Italy and Northern Asia. In the southern latitudes it always climbs to near the line of perpetual snow.

Having such a widespread range of climatal and soil influence, it is, as may always be expected in such trees, somewhat variable in character. It has produced some striking varieties which are amongst the best appreciated of our ornamental deciduous trees. By far the most elegant, however, is the variety known as *B. alba pendula*, the true silver weeping birch, which is only obtainable with any degree of certainty by grafting or budding it on the common birch. It does not freely or with certainty reproduce itself from seed, although it is occasionally produced in that way. Another very remarkable and distinct variety for ornamental planting is the recently introduced purple-leaved weeping birch (*B. alba purpurea*), which has leaves of a black purple tint and an elegant habit, although scarcely equal to the true weeping form in that respect. It must also be produced by means of grafting or budding, as it does not reproduce itself from seed.

The hardy nature of the tree, and its accommodating character as regards soil and situation, render it one of the most easy subjects to establish in forest planting. In good well-drained yet naturally moist land it grows most rapidly, but it makes more satisfactory progress in what may be called unfavourable positions for tree growth than any other of our hardy forest trees. It is essentially a tree for northern or high latitudes, and although commercially of comparatively little value in the milder parts of Europe and Asia, it is of the utmost importance to our own Highlanders and Islanders of the far north. In many parts it is in fact the only available timber for all purposes from the building of their houses to the furnishing of the same. The implements of industry and domestic utensils, such as carts, barrows, spades, boats, spoons, bowls, pails, ladles, platters, are all made of birch wood well seasoned. The Laplanders use the bark for the purpose of tanning the hides of their reindeer, and the famous Russian leather is prepared by a substance extracted from the bark by distillation. The twigs form tough and most durable ropes for the Highlanders and Laplanders, and as is popularly known to refractory youngsters, they also form a most salutary instrument of punishment in the hands of parent or pedagogue. Such are a few of the hundreds of uses of this hardy tree, but we must notice some other birches of not less interest and value, natives of other lands.

B. papyracea (the paper birch and canoe birch).—Americans and Canadians alike agree in regarding the timber of this species as valuable, being hard, durable, and beautiful of grain. It is mostly in repute for furniture and inlaying work. The bark is of the most durable character, retaining its structure intact long after, though the wood it enclosed has decayed and disappeared. It is used in covering log-houses, making boxes, cases, and hats, for inner soles to boots and shoes to prevent access of damp. The celebrated canoes of the North American Indians are made of the bark; selecting the largest trees, they remove the bark in long strips, which they sew together with the root fibres of the white spruce, and bind with these fibres on a light framework of wood. The seams are then made water-tight with a coating of the resin of the Balm of Gilead fir. A roomy canoe capable of carrying four or five persons may be thus formed, and weigh not more than fifty pounds. The tree is a most handsome one, of very rapid growth, and has been recommended for planting in this country for timber-producing purposes, but the recommendation has been acted upon only to the extent of introducing it into ornamental plantations.

B. lenta (mountain mahogany and sweet birch).—This is also a native of America, and is greatly prized in cabinet work for its beautiful close grain and its susceptibility of a high polish. This species also has been recommended for planting for timber in this country, but with the exception of introducing it in ornamental plantations, I am not aware of any effort to test its suitability or value as a timber tree in Britain.

B. populifolia (the poplar-leaved birch).—This is one of the most rapid-growing and handsome of the genus. I know nothing of the value of its timber, but if good it can be confidently relied upon as one of the most rapid-growing of hardwood trees. The foliage is larger than that of any other of the family, yet graceful and light in character and a fine tone of green. It is therefore a very desirable ornamental tree. There is a very elegant variety with incised leaves named *laciniata* which should be included in every collection of ornamental hardy trees.

A. X. E.

SEASIDE TREE-PLANTING AT SOUTH SHIELDS AND ELSEWHERE.

LOOKING from the High Level Bridge at Newcastle, the one impression conveyed by very multifarious objects is how art has swept off every trace of nature from the scene. The old "Puffing Billie," George Stephenson's first locomotive, stands beside us there as a unique monument of that change which makes the erst silvery Tyne, daughter of the Northumbrian Fells, an artificial canal studded with giant coal traders or energetic little tugs. Its banks too, for nine miles downwards, are little else than a continuous series of warehouses, chemical works, timber stances, shipbuilding yards, or forges. In an atmosphere teeming with discordant sounds and disagreeable smells, what an effort to conceive of this district once a scene of green fields or babbling brooks! Yet South Shields Park, just at the junction of the Tyne with the sea, has for the last summer been asserting the natural claims of this smoke-land to sylvan beauty. The new recreation-ground of this thriving borough is divided into two parks on either side of the road terminating at the pier, which stretches for some distance into the North Sea, opposite to Tynemouth, and long known to visitors as a delightful marine promenade. The intervening ground was covered by such refuse as a shipping port and chemical factories can produce. Huge ballast heaps, shifty quicksands, pools in which city youths indulged in aquatic sports, constituted about as unpromising abodes of ugliness in the vicinity of a thriving borough as could be singled out even in this district, so remarkable for the artificial distortion of natural landscape. Yet, given an energetic municipal surveyor like Mr. Matthew Hall, together with distress amongst workpeople, and a thoroughgoing town council, then presto the North Park with its ungainly ballast heaps is converted into green hills with sweeping terraces, from whose trim gravelled walks the eye may rest on the hoary ruins of Tynemouth opposite, or catch the ever-varying sea view at the mouth of the busy river. The park below extends in all to 13½ acres, and is laid out "so as to be a picture of prettiness and order," being protected from sand-drifts by a broad and ornate concrete wall seawards. The total length of the walks in the park is from 1½ to 1¾ miles. Of course there are the usual appurtenances of a public park, such as an ornamental entrance lodge, bandstand, rockeries and grottoes, all of which do infinite credit to the designer, Mr. M. Hall, the borough engineer, who has laid out the grounds, aided by professional advice from Fell & Co., Hexham, who also supplied most of the shrubs which were flourishing at the time of our autumn visit. This healthy progress in a spot exposed to the full brunt of the North Sea, in an atmosphere loaded with sea spray and chemical impurities, possesses a general sylvicultural interest. We saw conifers dying in the Tynemouth Park, on the opposite shore of the Tyne. But here and there the Ontario poplar, golden elder, sycamore, Huntingdown willow, oval-leaved privet, and common elder flourished. Thus the experiment reported on some time ago of successfully planting similar species on the sand-dunes of Holland is repeated on the Northumbrian coast. It would then appear that the way has been pioneered for corporations along our sea-coasts, employing surplus populations of idle workers crying for bread, as was the case in Dundee only a few weeks since. The number of relief hands at South Shields Park, which was begun during the dull autumn of 1884, varied considerably. Two shillings a day for seven hours' work kept many decent workers off the rates during the winter and spring months, while it helped to allay the spirit of disaffection. About £6000 has been spent on the North Park. The marked distress of last winter has not as yet showed itself, but the cost of completing the South Park has been estimated at £10,000; and the progress of the work will likely be much regulated by the needs of the unemployed operatives.

The South Shields Town Council held a special meeting on 16th December last, at which it was resolved to instruct the surveyor to proceed at once with the new works at the Park, so that the prevailing distress amongst workmen, *bona fide* residents in the town for six months or more, may be relieved. The town-clerk intimated that about £2000 would be thus expended in wages, at 2s. 6d. per day for each man. The borough engineer, along with Mr. Burns, park manager, have thus another opportunity for that admirable selection of trees suitable for the situation which they have so well displayed in the already completed Park.

In the successful sea-planting in Holland already alluded to, a protecting row of elms, ash, and maple was first planted facing the sea-breeze; and behind this another row was planted inland of poplars, willow, lime-trees, alder, chestnut, walnut, and plane; while the underwood comprised the sorb, elder, and sloe. It was found most expedient to plant these trees as tall shrubs in deep holes about three feet apart, which were kept open from autumn till the spring planting, when they were filled up with coarse-grained sand mixed with clay. The plants were fixed by two guards, to which they were tied by straw or willow wisps. T. A.

THE ORIENTAL PLANE TREE.

"PLATANUS *orientalis* [and its varieties], that ornamental introduction of 300 years ago, native to the Levant, Asia Minor, and Persia—not the American or Western plane tree, *P. occidentalis*—has been largely planted in recent years in situations where, as on the Thames Embankment, the million can admire it, and where, as time passes, our planes, like our oaks, will inspire veneration, and elevate the thoughts.

"Referring briefly to the planes of history, among the many famous trees growing on the shores of the Mediterranean, one of the greatest antiquity, most justly venerated, grows in the pass of Thermopylæ. None of the planes of our own country have yet lived long enough to have attained old age, according to the period of their existence in the East. There are, for example, the so-called 'Seven Sisters' growing on the shores of the Bosphorus, whose age has never been discovered, and no remaining record is likely now to reveal it; but they are known as a matter of undoubted history to have sheltered a party of English Crusaders in the eleventh century. They are believed to be the oldest planes in the world.

"Such was the beauty of a large plane tree standing in its prime on the soil of Greece, on land which was no doubt sheltered, watered, drained, and fertile, that Xerxes, on his invasion of that heroic little country, was fascinated by it, and remained chained to the spot for a whole day. A Napoleon or a Gladstone would have cut it down and marched on, but Xerxes remained quite entranced gazing upon the tree and sitting down beneath it. In war and gardening delay of this kind is fatal, and so it proved to the luxurious monarch, who passed on at last and was completely beaten by the Greeks. Among other famous and historic planes, Pliny mentions an aged tree which he himself had seen in Phrygia, and among whose boughs the vain musician Marsyas, as the story ran, had been suspended by Apollo when he flayed him alive after his defeat, the unhappy mortal having challenged Apollo to a trial of skill. Another plane of romantic interest was that which Helen of Troy planted in Arcadia, and which Pausanias described as a tree of great beauty, as well as size, at the age of 1300 years.

"Interesting notices of another tree were successively published by the three travellers, Hobhouse, Buckingham, and Chandler, who each described a noble plane growing on the banks of the Selinus, near Nostizza. To this tree has been assigned a diameter of 15 feet, a deceptive measurement, which must have included spurs at the base, and which conveys to the mind no idea of the size of the tree. In Persia this stately tree, called there the Chinar, is frequently met with in avenues, or in company with the Lombardy poplar, affording shade and ornament to the dwellings of the peasants, or along the margins of the streams and watercourses.

"Planes may readily be found in England 14 feet in circumference, measured fairly at 5 feet from the ground, and reaching a height of 80 feet. They require suitable soils and situations for their greatest growth. They are not perhaps fastidious, but there are two or three essentials to their most successful cultivation, which must not be overlooked in planting them.

"Unlike the sycamore, an *Acer* which was dubbed *Pseudo-Platanus*, and which runs over the hills of Europe, a native of Italy, Switzerland, and Germany, and doubtfully indigenous in Britain, a hardy tree, with stout twigs bearing storms well, the plane loves shelter. It is a tree for vales rather than hill-tops, and requires proper soils, while the sycamore can accommodate itself to a variety of soils as well as sites. The plane cannot endure a clay soil, and the shade of other trees proves obnoxious to it. It also requires good land, light rather than heavy, with natural drainage, but at the same time moisture at the roots, and a deep, free soil. In proper situations, in short—and, it may be added, wherever the lime grows best, as single specimens or as groups upon the lawn, where it spreads itself wide and may be distinguished from the maples at a glance by the scaling off of the bark and the round rough fruit—the plane may be often observed. I noticed some very noble specimens last summer at Hursley in the shrubbery among other trees, all favourites of the late Sir William Heathcote. The plane is a common ornament of English parks and gardens, as any observer of trees may know if he consults his memory (having travelled much), or Mr. Loudon, if he has read that delightful writer.

"An enthusiastic admirer of the plane has said of it, that there is a mild majesty in its aspect and a grace in its form and in the disposal of its foliage, which admits light playing amongst its leaves and creates shade beneath the canopy of its branches, and renders it one of the best models of elegance which the vegetable kingdom can exhibit. Owing to its great beauty, therefore, as well as its tolerance of smoke, the plane is obviously the best tree for the embellishment of great cities, the best for populous and conspicuous places for the improvement of public taste."—H. E. in *Gardener's Chronicle.*

PICEA BREWERIANA.

WE cull the following account of this new Californian conifer from *The Proceedings of the American Academy*:—"Branches slender, often elongated and pendent, puberulent; leaves 5 to 12 lines long, ½ to nearly 1 line wide, strictly sessile upon the slender base, obtuse, smooth and rounded or slightly carinate above, stomatose beneath on each side of the slightly prominent mid-nerve; cones 3 inches long, narrowly cylindrical, attenuate at base; bracts linear-oblong (2 inches long), a fourth of the length of the puberulent scale, which is obovate, with the rounded thickish summit entire; seed 1½ lines long, the wing 4 lines long by 2½ broad. This unusually distinct species has been found (by Thomas Howell, in June 1884) only at high elevations in the Siskiyow Mountains, California, and on the head-waters of the Illinois river, in rather dry rocky ground. It grows to a height of from 100 feet to 150 feet, and a diameter of 1 to 3 feet. Bark reddish. The specific name is given in compliment to Professor W. H. Brewer, who in connection with the California State Geological Survey had so much to do with the botany of the State, both in the field, and in the after disposal of the collections of the survey. As he took special interest in the trees of the coast, and collected a large amount of material for their study, it is fitting thus to connect his name with the forest trees of California."

NOTES ON THE GENUS RHUS (SUMACH).

THIS is an interesting genus, alike on account of the products of some of the species and the elegance of character of the leaves of many of them. They are small growing trees or shrubs, inhabitants of the South of Europe, Cape of Good Hope, North America, China, Japan, Java, and Nepal. There are some forty species to be found scattered over these several countries, and while they preserve certain points of family resemblance in common, they present, as might be expected from such a wide range of habitat, very strong individual characteristics. Comparatively few are cultivated in this country,—six or seven being as many as may be found in the lists of our leading nurserymen,—though why they should not be more generally cultivated, considering the elegant form of the foliage and the brilliant colours which that of many of them assume in autumn, is rather difficult to explain, except, perhaps, that the baleful reputations of some as to their poisonous nature may have laid all under suspicion.

The genus belongs to the natural order *Anacardiaceæ*, the *Cashew Nut* family, an order of great botanical as well as some commercial and medicinal interest. The flowers in some of the species of *Rhus* are hermaphrodite, while in others such as *R. toxicodendron* they are unisexual or hermaphrodite, or both conditions may be concurrent on the same plant or even in the same spike of flowers. The reason given by botanists for this peculiarity is that the reproductive organs of either sex are liable to fail in development by the process of abortion—a reason which may well enough serve our present purpose, but which merely points at the same time to the result of an undefined cause. The following are a few of the most remarkable species:—

R. coriaria is a small tree growing about 10 feet high, with elegant pinnate leaves. It is said to supply the bark with which Turkey leather is tanned. It is greatly in repute as a tonic and cooling agent in decoction, in the south and east of Europe, and the peasants of Podolia, the Ukraine, and Russia generally, use it in decoction with *Genista tinctoria* as a preventive of hydrophobia. In Aleppo the seeds are in constant use as a tonic. The tree is a native of the South of Europe generally, and is hardy in this country.

R. typhina is a tree of larger growth than the preceding, and has a wide range of habitat in North America, where it is commonly called the *Virginian sumach*, and sometimes also the *Stag's-horn sumach*. It has a long list of uses in the arts: the wood and bark are both equally useful in tanning, especially white glove leather; it is used by dyers to give tone to black, green, and yellow colours, and treated with alum, the ripe berries make an excellent dye for hats. From incisions made in the bark, there exudes a milky juice which when dried forms the basis of a varnish said to be equal to the best Chinese, and it is further said that the flowers yield more honey, and that bees are fonder of it than of any other flowers.

R. toxicodendron (the poison oak). This a less reputable tree, or rather shrub—for it never assumes arboreal proportions—than either of the preceding. It is a native of North America, where it is known by the significant common name above given. Although there is little doubt the plant is poisonous in a high degree, yet there are those on whom it appears to be quite innocuous; some have suffered severely from any lengthened exposure to the exhalations from its leaves, while others have felt no ill effects from similar experience in precisely the same circumstances. It has one very extraordinary peculiarity: the sap, if used to mark linen, makes an indelible stain which the more it is washed becomes the deeper. The gum or hardened juice, it is said, has been applied successfully in cases of paralysis.

R. copallina. This was long erroneously believed to be the source of the celebrated *gum copal,* which is now, however, believed to be the product of a Mexican tree which is in no way related to the Sumachs. It is one of the few species that may occasionally be found in this country in ornamental shrubberies.

R. vernicifera (Japan varnish tree). This furnishes the varnish with which the celebrated lacquer-work of Japan is made. So transparent is it, that when laid in its pure unmixed state on uncoloured wood, every vein and fibre are clearly visible, apparently even rendered more visible than they were prior to being coated with the varnish. When applied on a dark ground, it produces the reflecting qualities of a looking-glass.

R. venenata (Swamp Sumach or Poison Wood of the Americans). This, like the last, yields a very superior varnish, which, however, is not much sought after, probably owing to the highly poisonous character of the tree. Some have suffered violently from merely inhaling the exhalations from the leaves and bark, becoming swollen and feverish, and the skin of the extremities and glandular parts breaking out in inflamed blotches, which are succeeded by watery pustules, attended with violent itching and burning; but it rarely ends in death, although the ill effects may remain for some time. It is singular that all who come under its influence are not affected in the same violent degree, and that some are capable of handling the plant freely at any time without any ill effects.

R. glabra.—This is another North American of elegant character, and which is not uncommon in our ornamental shrubberies. The fruit is eaten freely and with impunity by children, although by no means agreeable, being very sour and astringent; but these qualities are concentrated in the skin or downy surface, which, when removed by washing it away in warm water, leaves a tolerably pleasant mouthful for young folks. The leaves produce excrescences resembling oak galls, which contain strong concentrations of tannic and gallic acids, and appear on trial to have proved superior to oak galls.

R. cotinus (Venice Sumach). This is one of the more common of the species to be met with in our gardens, and is sometimes called *Burning Bush* on account of the brilliant autumn tint of crimson the leaves assume. It is largely used in Italy for tanning, all parts of the plant being found applicable to the purpose, and is known under the name *Scotino.* The wood of this species is used in Greece for dying wool a beautiful tint of yellow.

R. pinnila, an American species, is perhaps the most poisonous species of the genus. It is stated that Lyon, an American botanical collector, was poisoned throughout his whole system when merely collecting the seeds, and that he was lame for long afterwards.

It may be seen, however, from the foregoing, that the Sumachs are not all bad, though some are certainly very undesirable as furniture for English pleasure-grounds, notwithstanding their beautiful foliage and general attractiveness. JOHN ANDREWS.

INDIAN FORESTRY REPORT.

THE progress report of Forest Administration in the Hyderabad Assigned Districts for 1884–85 has just been received, and contains a mass of interesting, if not in all respects satisfactory details.

In the work of survey and the marking of boundaries, considerable progress has been made, upwards of 375 square miles having been surveyed in detail, and described on maps to scales of 4 inches to the mile, and 2 inches to the mile. The larger scale is adopted with the view of embracing the measurements of all fiscal boundaries, as well as the individual holdings of each village. On the subject of protection from forest fires, the report shows most satisfactory results, and evidence of careful management on the part of the forest guardians in the use of preventive measures, and also of the hearty and voluntary co-operation of the natives in the work of extinguishing fires when they occur. The Raipur Block and Bairagarh Reserve, comprising considerably over 400 square miles, and described as the largest area of forest under fire protection in India, has been exempt from fires for the last thirteen years. It is observed that the financial results are not so satisfactory this year as in that preceding. This is ascribed to three causes, viz. diminished demand for timber for building purposes, owing to 1885 being Sinhast year, during which the Hindus put up no new buildings; also the cotton crop being below average, the ryots had less money to spend on wood, and the death of the officer whose duty it was to superintend the collection of forest dues. The dues fell off at once, owing either to the carelessness or dishonesty of those appointed in his place; for two were appointed and removed successively, it appears, on the ground of suspicion of fraud, for which the spot presents excellent opportunities.

APPOINTMENT.

MR. J. M. FORSYTHE, forester to the Right Hon. Viscount Clifden, Gowran Castle, Ireland, has been appointed wood manager to his Grace the Duke of Bedford, Woburn Abbey, Bedfordshire. Mr. Forsythe will doubtless be much missed alike by his employer and the tenantry and workmen on the Gowran Castle estate, but he goes to a demesne where the oaks and elms and chestnuts in the richly timbered park teem with ancient historic interest.

METEOROLOGY.

AT a meeting of the Botanical Society held last month, Mr. Robert Lindsay reported on the progress of vegetation at the Royal Botanic Gardens for the month of November, as follows: A series of low readings of the thermometer were registered from the 15th till the 19th of the month. Since then open-air vegetation had gradually declined, and at the end of the month had nearly reached its lowest ebb. On nine occasions the thermometer fell below the freezing-point, indicating collectively 65 degs. of frost, as against 64 degs. for the corresponding month last year. The lowest readings were—on the 15th, 23 degs.; 16th, 19 degs.; 17th, 18 degs.; 18th, 15 degs.; and 19th, 28 degs. The highest morning readings were—on the 3rd, 56 degs.; 7th, 51 degs.; 8th, 48 degs.; and 27th, 45 degs. The lowest day temperature was 31 degs., on the 17th, and the highest 63 degs., on the 3rd. The rainfall was very light, there being no less than twenty-two dry days during the month. Rain fell more or less daily from the 25th till the 29th. Very few plants were in flower out of doors. On the rock garden only one species came into flower—viz., *Crocus hadriaticus;* and with the exception of *Jasminum nudiflorum* and *Hamamelis virginica,* which came into flower in other parts of the garden, no others were observed as having come into blossom during November. Although there were still a few left which had opened previously, vegetation generally had gone sooner to rest than was the case last year, and there were fewer plants in flower. This result was mainly due to the distribution of cold having been different. The aggregate amount of frost registered was nearly the same as that in the corresponding month last year. Still, the individual minimum readings were lower in consequence of the distribution of frost having been confined to a less area, which showed that in dealing with this subject average temperatures were apt to be misleading.

OBITUARY.

WE regret to have to announce the death of Mr. James T. Allan, at Omaha, Nebraska, U.S.A. Mr. Allan was a well-known writer on agricultural and horticultural subjects. He wrote a book entitled *Forests and Orchards,* which excited much favourable comment, and old readers of *Forestry* will remember many contributions from his pen appearing in these pages. For several years he has been superintendent of tree-planting on the Union Pacific Railroad and has done effective work in that direction.

SOCIETIES.

ENGLISH ARBORICULTURAL SOCIETY.

ANNUAL MEETING.

THE annual general meeting of the English Arboricultural Society was held on Saturday, 28th November, in the Farmers' Club Room, Newcastle. C. J. Bates, Esq. of Heddon Banks, presided, and among those present were—Mr. J. Balden, Dilston; Mr. Gally, Ravensworth Castle; Mr. W. Havelock, Mr. J. W. Robson, Mr. W. Fell, Hexham; Mr. Wardle, Newcastle; Mr. Anderson, Moss Wood; Councillor Gray, Newcastle; Mr. W. F. Taylor, Carlisle; Mr. Milne, Hexham; Mr. Wilson, Leazes Park; Mr. P. S. Wilkinson, Mount Oswald; Mr. Cowan, South Shields; M. J. Davidson (secretary), Haydon Bridge, etc.

Mr. Davidson read letters from the Earl of Durham and Mr. George Howard, expressing their regret at being unable to attend.

The Secretary (Mr. J. Davidson) also read the report of the Council, which showed that the number of members in the published transactions for the last year was 107. During the year there had been three deaths and three resignations, reducing the membership to 101. It was hoped, however, that the resignations would be reconsidered. There were 22 new members proposed, bringing the total to 124; and of these six were life members, which was considered a very good proportion. The new members proposed were as follows:—

J. H. Straker, Esq., Stagshaw; Councillor Gray, Newcastle; Mr. J. Wilson, Leazes Park, Newcastle; Mr. Malcolm Dunn, Palace Gardens, Dalkeith; Mr. Donald Frazer, Poole, South Milford; Mr. William Wear, Hexham; Mr. H. Forster, Bradley Cottage, Durham; T. Taylor, Esq., Chipchase Castle; Mr. Winship, Newcastle; Mr. E. J. Baillie, F.L.S., Chester; Mr. J. Dodd, forester, Blagdon; Mr. Gilbert, gardener, Blagdon; Mr. W. Hudson, Cragside; Mr. Augustus Parnell, Newport; Messrs. James Dickson and Son, Chester; Mr. Wm. Russell, Llandery, Radnorshire; Mr. W. Cupar, Ashford, Galway; Mr. W. F. Taylor, Carlisle; Mr. Black, Malton; Mr. W. Taylor, Edinburgh; Mr. J. Clark, Nurseries, North Shields; Mr. Gally, Ravensworth Castle; and Mr. Jewitt, Mickley.

Mr. Baldwin proposed, and Mr. Cowan seconded, that the new members should be passed, which was agreed to.

The Treasurer (Mr. J. Davidson) then read the financial report as follows:—

Balance in hand from last year's account, £23, 8s.; subscriptions received from ordinary members, £29, 1s. 6d.; from life members, £10; received for advertisements in published transactions, £2, 7s.; total, £65, 6s. 6d. Payments—Paid for use of rooms for meetings, 9s. 6d.; printing and stationery, £4, 5s.; postages, £3, 11s. 4d.; expenses in connection with lectures by Dr. Lyons, £2, 1s. 6d.; excursion to Cragside, £2, 19s. 4d.; publication of transactions, £9, 15s.; auditing accounts, £2, 2s.; salary of secretary and treasurer, £10; total, £35, 3s. 8d.; balance in hand, £30, 2s. 10d. Although the balance is £30, 2s. 10d., there were arrears of subscriptions, which, when paid up, would bring the balance up to £45, 0s. 4d. Of this sum, £29, 8s. was contributed by life members.

Councillor Gray moved, and Mr. Wm. Fell seconded, that the accounts be adopted, which was agreed to.

Mr. J. W. Robson moved that out of the balance in hand £30 be invested in the name of and for the benefit of the Society.

Councillor Gray seconded the proposition, remarking that the subscription of life members should not be looked upon as current income.

The motion was unanimously agreed to.

With regard to the essays on Larch Disease, to be written by members of the Society, it was decided that the first prize should be a silver medal value £3, and the second a medal value £1.

Mr. Balden, in accordance with notice given at last year's annual meeting, proposed an alteration in rule 12 of the Society's rules. The rule at present read: "The affairs of the Society shall be conducted by a president, twelve vice-presidents, secretary, treasurer, two auditors, and twenty-one councillors—these office-bearers to be elected annually at the general meeting in November—the two vice-presidents at the top of the list to retire by rotation annually, but one shall be eligible for re-election; the five councillors at the top of the list shall retire by rotation annually, but shall be eligible for re-election." He thought that the objection was only one vice-president retiring. It might be thought that they favoured one more than the other. He would propose that they should delete the word one, and make the rule read, "but shall be eligible for re-election." He would also propose that all the retiring councillors should, in future, be eligible for re-election.

The Chairman said he wished to call their attention to another matter. In most other societies they changed their presidents every year. He thought that they should make the Earl of Durham a patron, and ask Mr. George Howard to become president for the ensuing year.

Councillor Gray thought it was very desirable that they should change their president every year. They would not then give any undue preference to any county. It would be very satisfactory and very beneficial, and make more people take an interest in the Society.

Mr. Balden: The question seems to be, whether presidents should be made patrons or go back into their old places.

Councillor Gray: I would make the life members patrons. Are all the life members of the Society among the vice-presidents?

The Secretary: Nearly all; only those newly elected are not.

Councillor Gray: I would make them all patrons.

The Secretary: The patrons would almost necessitate a further altering of rule 12.

Mr. Balden: I would provide a new rule.

Mr. Cowan then seconded Mr. Balden's original proposition, which was agreed to.

Mr. Wilkinson then moved that those who served as president should be placed, if they were so inclined, on the list of patrons.

The Secretary: We cannot afford to lose the working of the members.

Councillor Gray: Their being made patrons does not hinder their being office-bearers. I second the motion.

The motion was unanimously agreed to.

The election of the officers was then proceeded with, and, on the motion of Mr. Balden, seconded by Councillor Gray, the Earl of Durham was appointed patron, and Mr. George Howard president.

The Chairman said the two vice-presidents who retired by rotation were Mr. George Howard and himself. Mr. George Howard was already president.

The Chairman was unanimously re-elected, and Councillor Gray's name was added in the place of Mr. George Howard.

The Chairman said that Mr. J. Straker, of Stagshaw, had died during the year, and it was necessary to elect some one in his place.

It was unanimously agreed that Mr. J. H. Straker should be added in the place of his father.

The Chairman said the five retiring councillors were Mr. Balden, Dilston; Mr. M. Clark; Mr. H. Clark, Blenkinsopp; Mr. J. W. Robson, Hexham; and Mr. Nesbit.

Mr. Fell proposed that the retiring councillors should be re-elected. They were those who first took part in forming the Society, and he thought they were entitled to re-election.

Mr. Wardle seconded the motion, which was agreed to.

The Chairman said there were five more councillors required, and it was agreed that the following gentlemen should be added to the list:—Mr. Cowan, South Shields; Mr. George Dixon, Chester; Mr. Black, Malton; Mr. Patterson, Isle of Wight; and Mr. Wilson, Leazes Park.

The Secretary moved the re-appointment of the local secretaries, with the addition of Mr. Patterson, of the Isle of Wight, which was seconded by Mr. Milne, and agreed to.

Mr. Wardle proposed the re-election of Mr. Davidson as secretary and treasurer.

Mr. W. Fell said he did not think they could have a better man. They were much indebted to Mr. Davidson. He had carried on the work in an agreeable and very able manner. He had throughout shown the greatest kindness and courtesy to the members, and he thought they owed him a debt of gratitude for his able management of the Society since its commencement. He had great pleasure in seconding the proposition.

The motion was unanimously agreed to.

The auditors, Mr. Balden, Dilston, and Mr. Bowmaker, Naworth, were also unanimously re-elected.

The question of engaging a photographer for the Society, and other matters, were left in the hands of the committee of transactions.

The reports of Local Secretaries were heard, Mr. Wardle remarking that very little had been done in the way of reading papers or pushing the claims of the Society in his district, but it arose more from being busily engaged in other things than from lack of interest in the Society.

The Secretary said they had had some meetings in the neighbourhood of Hexham, but more activity was wanted among individual members and local secretaries. There was an existing necessity for the science being pressed to the front, and the Arboricultural Society was calculated to do it. Politics at present seemed to be the order of the day, and though reforming politicians had much to say on the land question, there was nothing about Forestry; and when they looked at the millions of acres of waste land in the United Kingdom, they were forced to the conclusion that, instead of the population that are overstocking the towns and cities, and others in the country getting their three acres of land, they could have fifty, but the forester must precede them and prepare the way; so that there is every inducement for the Society and its workers to hold on their way, and seek to advance its claims, and prove it to be a national benefit.

Some other matters, such as a register for foresters and an excursion for 1886, were left to the decision of the Council.

The Chairman addressed the meeting and expressed his pleasure at the progress the Society was making. He thought a great deal might be done by getting hold of the members of the Scottish Society who lived in England, and get their co-operation, and in this sense considered that a little Home Rule would be healthful for the Society and still preserve that kindly feeling that existed between them.

Mr. B. Cowan, South Shields, then read an interesting paper "On Trees and Shrubs suitable for the Seaside and where Alkali and other Gases are prevalent," after which the meeting terminated.

ROYAL CALEDONIAN HORTICULTURAL SOCIETY.

THE annual meeting of this Society was held within the Music Hall buildings, Edinburgh, on the afternoon of Thursday, December 17, 1885. Mr. John Methven presided. The Treasurer (Mr. P. Neill Fraser) submitted an abstract of the accounts for the twelve months ended 30th November, showing the receipts to be £1878, 17s. 5d., and the payments £2104, 16s. 2d., leaving a deficiency of £225, 18s. 9d. For admission to shows there had been drawn—Spring (two days), £462, 18s. 9d.; summer (two days), £301, 3s. 9d.; autumn (two days), £345, 3s. 11d.; winter (four days), £222, 13s. 3d.—£1331, 19s. 8d.; while the expenses were—Spring show, £215, 10s. 1d.; summer show, £204, 18s. 5d.; autumn show, £208, 18s. 1d.; winter show, £444, 18s. 5d.—£1074, 5s. The total funds of the Society as at the date above mentioned were set down at £1002, 17s. 8d., as compared with £1249, 0s. 5d. at the corresponding period of 1884. It was stated that if the winter exhibition had not been held the Society would, on the ordinary accounts, have had about £165 to the good. The chairman thought they might consider that the money had been well spent, and the Treasurer added that he was of opinion that good work had been done for it. Mr. Dunn, Dalkeith Gardens, observed that the winter show was a new venture, and that unfortunately it fell to be held during the heat of the general elections. They had also held an Apple and Pear Congress, and he believed that, taking it all in all, they might congratulate themselves on getting through so much work last year. The accounts were then passed. The Secretary (Mr. John Stewart, W.S.) and Treasurer were re-elected. On the recommendation of the Council, the Earl of Rosebery was elected a vice-president; Mr. Norrie, of the Union Bank, and Mr. D. B. Laird, councillors of the Society, in room of those who retired. The Chairman, in his remarks, said he thought it was much to be regretted that the nobility in the vicinity of the city did not take more interest in the Society's shows than they did.

SCOTTISH HORTICULTURAL ASSOCIATION.

THE ninth meeting of the session of the Scottish Horticultural Association was held on Tuesday, 1st December, at 5 St. Andrew Square, Edinburgh—Mr. Alex. Milne, nursery and seedsman, in the chair. The evening was occupied by the reading of a paper prepared by Mr. F. W. Burbidge, F.L.S., curator of Trinity College Botanic Gardens, Dublin, on "Orchids Abroad and at Home." The paper gave a most interesting and detailed account of the native growth of the orchid, as the writer had seen it in the forests of the island of Borneo. There the orchids grow wild on the tops of the forest trees, and one can walk for miles without seeing the sun, which necessitates the use of a compass for the purpose of finding one's way, the same as on board a vessel at sea. He described the peculiar character of the light there, and stated that the ground everywhere was covered with steel-grey ferns and mosses, while the marshy places were covered with aeroids. Referring next to the cultivation of orchids in this country, he inculcated the necessity of growing orchids under as nearly the same conditions as in their native wilds. While air, moisture, and feeding could be imitated to a great extent, the principal difficulty, he said, was with regard to light, for while they could shade when there was too much of it, there was no way of getting more light when there was too little. Speaking of the favour in which orchid-growing was held in this country, he said that some of them realized from £100 to £200 each, and merchant princes paid these prices with the same alacrity as the Dutch burghers many years ago paid 1300 florins for a single tulip bulb. The paper was illustrated by a sketch map of the world, drawn by Mr. Burbidge for the recent Orchid Conference in London, showing in light and deep red the latitudes in which orchids were grown more or less, with temperature, altitude, and other details. Mr. Alexander M'Millan, Edgehill, Dean, showed a chrysanthemum, and Mr. David Redmond, Belfast Banking Company, Antrim, a collection of dried hardy plants, which he gathered in the north of Ireland.

REVIEWS OF BOOKS.

Studies of Plant Life in Canada. BY MRS. C. P. TRAILL, Ottawa, Woodburn.

TO the loving student of nature, whether he be scientific or not, this will prove a delightful book. It is an essentially popular work, in which the jargon of science has been all but eschewed. Yet it abounds in vivid pictures of the familiar plant life,—shrubs, trees, flowers, and ferns of the vast prairies and forests of Canada. Although written by a lady who has attained her fourscore years, there is a charmingly fresh crispness and truth in the style in which she unfolds her earlier and later experiences of the changes in plant as well as man's life that have resulted from extending civilization that arrests the attention and excites the admiration of the reader.

There are a few chromo-lithograph illustrations which are not in point of execution at all equal to the author's true and vigorous delineations of the subjects illustrated. Believing our readers will derive as much pleasure in the perusal of the following extract on the hemlock as we ourselves have done, we give it at length:—

"One of the loveliest and most graceful of our forest trees is a young hemlock. As great a contrast does that elegant sapling, with its gay, tender, green, feathery sprays, bear in its beauty of form and colour to the parent tree, with its rugged, stiff, and unsightly trunk and ragged top, as the young child in its youthful grace and vigour bears to the old wrinkled grandsire. The foliage of the young hemlock in the months of June and July, when the spring shoots have perfected, is especially beautiful; the tender vivid green of the young shoots at the end of the flat bending branches of the previous year appears more lively and refreshing to the eye in contrast to the older dark glossy, more sombre foliage which they serve to brighten and adorn.

"The hemlock does not reach the lofty height of the white pine, though in some situations it becomes a giant in size, with massive trunk and thick, bushy head; the bark is deeply rifted, dark on the outside, but of a deep brick-red within; the branches are flat; the small oval, soft cones appear later in the summer on the ends of the shoots of the previous season. The timber of the hemlock is very durable, tough, and somewhat stringy, loose-grained, but is said to resist wet; it is used for granary flooring, rail-ties, and some other purposes in out-door work. The bark is used largely in tanning. The backwoods settlers stack the hemlock bark while clearing the forest land, and carry it in during the sleighing season to the tanneries, receiving a certain value per cord, in money or store goods. Formerly the payment was chiefly made in leather, when every man was his own shoemaker; but times have changed since those early more primitive days, and the wives and children would disdain to wear the home-made boots and shoes that were manufactured out of coarsely-dressed leather by the industrious father of the family in the long winter evenings, as he worked by the light of the blazing log fire with his rude tools and wooden pegs.

"The old shanty life is a thing of the past; the carding and spinning, the rattle of the looms, even the knitting needles, are not now so constantly seen in the hands of the wives and daughters as formerly. Railroads and steamboats, schools, and increase of population have wrought great changes in the lives and habits of the people. Villages and towns now occupy the spots where only the dark forests of pine and hemlock, maple and beech, once grew. The trees disappear indeed before the axe and the fire, but they reappear now as ornaments planted by the hand of taste in the gardens, and as shade trees in the streets of the towns and cities; and this is good, it speaks of taste and culture. The hemlock, however, is less frequently seen about our dwellings, beautiful as it is, for it is tardy in growth, and does not take kindly to cultivation. Its natural soil is dry, rocky, or gravelly land."

The Scottish Geographical Magazine. Printed for the Society by T. & A. CONSTABLE, Edinburgh.

LIEUTENANT A. W. GREELY'S Anniversay Address, dealing chiefly with recent Arctic discoveries, is the leading article in the December number of this spirited monthly. Two articles on Iceland, one dealing with the great volcanic crater, and the other with the mountainous regions of the interior, will both be found interesting to Scottish geographers. Dr. Thomas Muir's short and pithy paper on the Caroline Islands completes the number.

TRADE CATALOGUES RECEIVED.

Catalogue of Forest Trees, Conifers, Shrubs, etc. Season 1885–86. Ben Reid & Co., Nurserymen, Aberdeen.

Rose List. Ben Reid & Co., Aberdeen.

Forest, Fruit, and Ornamental Trees, etc. Catalogue for Autumn 1885 and Spring 1886. Thomas Kennedy & Co., Nurserymen, Seedsmen, etc., Dumfries.

Priced Catalogue of Forest Trees, Ornamental Trees, and Shrubs, etc. William Fell & Co., Nurserymen, Wentworth Nurseries, Hexham, Northumberland.

Messrs. James Dickson & Sons, Newton Nurseries, Chester. A comprehensive and excellent list of forest trees, covert and underwood plants, ornamental trees and evergreens, containing also lists of hardy Azalias and other hardy American plants, and of twining and climbing plants.

FOREST WORK FOR THE MONTH.

ENGLAND.

THE keen frosts which we have experienced in December are precursory of what we may expect in January, when cold northerly currents usually prevail, and bring with them some of the rigours peculiar to those regions from which they come.

ORCHARD.—The directions given for last month are equally applicable to this.

WOODS AND PLANTATIONS.—Planting should be continued during open weather, and pushed on as speedily as circumstances will permit, that as little as possible may be left for the month of February; although that month, under certain circumstances, such as an abundance of ground game, is more propitious for successful planting than the other winter months that have passed away, as there is then less danger of the planter's efforts being rendered abortive by the browsing propensities of the furry vermin.

During frosty weather, when planting is impossible, the works of thinning and pruning may be pushed forward, as also the cutting of underwood, and the shredding of oak coppices. Continue also to fell timber for sale, or for the necessities of the estate.

Repair fences as directed for last month, and push on agricultural draining, to complete before the spring work of the farm relegates the drainer to other scenes, beyond the busy turmoil of cultivation.

NURSERY.—When the weather is favourable, sow those seeds that were kept in pits during the summer, and also acorns and chestnuts. Collect cones of coniferæ, and store away dry until the season for committing them to the seed-bed.

Renew the fertility of ground that has been heavily cropped by applications of fresh soil, rotted turf, or leaf mould, and transplant hawthorn before the buds begin to expand.

PLEASURE GROUNDS. — Gather up fallen leaves from all the corners and odd places into which they may have been drifted by the winds, and place them in proper depots to be rotted into manure. Turn over those heaps made up last year, and turn and mix compost to prepare it for being carted out to such places as it is intended to enrich by its application.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

ALL hedge pruning and digging should be carried on as expeditiously as possible, and the prunings cleanly raked and burnt in suitable places, observing always to do so at a good distance from anything, whether hedges, trees, or other subject, liable to injury, whether from the flames or heat. New hedges may be formed as recommended last month through preparing the hedge bed: trenching, pulverizing the soil, and thorough drainage should be strictly attended to.

Sharply look after trees, shrubs, young plants, and plantations of all kinds, including hedges, that they be not injured by ground game. Wire netting in its own place is an excellent protection whether for groups or single trees; but where its use is impracticable, the composition made by Nathan Ahlbottn, 50 Shore Street, Leith, will be found most efficient.

Shooting rides may be formed and whins or gorse cut, whether to relieve trees choked by them, for access to kill rabbits, or other reasons.

Drains should be well looked to that they be kept clear of branches, leaves, etc. Neglect in this is often fraught with very serious consequences, which can never be remedied by any future efforts.

Cutting timber of all kinds except such as is to be barked should now be done, and birch, heather, and wood of all kinds should also be cut, and cleared from the plantations and stacked or piled up, in their respective places.

Planting should also be prosecuted whensoever the ground is in proper condition for doing so, but not otherwise.

Fences and especially wire fences should be seen to that no wires are broken by the frost, which is a very common occurrence in hard frosty weather.

Preparing cuttings, trenching, digging, and lifting plants in the nursery are also departments of work to be kept well in hand. Making brooms, summer seats, and all similar work can be done to advantage by handy men, during stormy weather when other work cannot.

G. Y. MICHIE.

CULLEN HOUSE,
12*th December* 1885.

LETTERS TO THE EDITOR.

ROSS-SHIRE FORESTRY.

SIR,—Would you kindly allow me space for a few remarks regarding a letter by Mr. W. F. Gunn, Strathpeffer, which appeared in your November issue.

In the first place, it is quite true, as stated by Mr. Gunn, that I received a long list of queries from a friend who was then forester at Strathpeffer, with a request that I would answer them in detail for Mr. Gunn's information. This list I submitted to my employer, and he told me to please myself whether I answered them or not. Being very busy at the time with estate work, and only having been about a year in Ross-shire, I wrote my friend saying that I had no time to answer his queries in writing, but that I would give any information I could verbally.

Mr. Gunn explains how he made a mistake regarding the acreage of wood on this estate, and in doing so he takes it for granted that the whole of Novar Woods are entered in the Valuation Roll for the sum of £92, 5s. If Mr. Gunn had taken the trouble to make a few inquiries, he would have found that a large extent of wood constitutes part of Novar Sheep Farm; and that considerable portions of wood are entered as grazings in connection with other holdings on the property.

The remainder of Mr. Gunn's letter is a qualified admission that his report regarding Novar Woods is inaccurate; only, when he speaks of the prices of Ross-shire timber, he insinuates that my experience in the sale of timber began in Ross-shire, and that I gave the prices obtained on a certain estate mentioned in my letter to you last July. So far as my experience of timber sales is concerned, Mr. Gunn is welcome to his opinion; but a reference to my letter would show him that I gave the principal outlets for larch and fir in this county, and the prices obtainable in the open market for the said timber, after being manufactured and sent to the consumers, as also the probable cost of manufacturing and sending to these markets; and that I based my calculations on the prices Mr. Gunn in his report gave as current in 1883.

I may here add that neither in 1883, nor indeed since 1880, were the lowest prices quoted in Mr. Gunn's report current in Ross-shire. As stated in my remarks on Mr. Gunn's report, a higher price could and can still be got for timber wanted for special purposes; but those sales are few and far between, and it was very difficult in 1882 or 1883 to get 1s. 3d. per cubic foot in the wood for heavy larch suitable for shipbuilding, as the purchaser had to pay a pretty heavy sum for carriage to send it from Ross-shire to a shipbuilding yard, and after he got it there he might perhaps find that steel was preferred. However, at odd times, a heavy clean larch, suitable for fishing-boat rudders, and a lighter class of larch suitable for boatskin, would fetch more than 1s. 3d. per cubic foot; but these are specialities, as they must be of a size and character suitable for the purposes to which they are designed to be put.—I am, sir, yours faithfully, D. ROBERTSON.

NOVAR, EVANTON, *7th December* 1885.

RAISING PLANTATIONS OF OAK FROM ACORNS INSTEAD OF PLANTING.

SIR,—Being desirous of making a considerable plantation of oak for timber in good deep land, which is, however, somewhat moist, but not what could properly be described as wet, I should be obliged for your opinion as to how I should proceed. I have been advised by some to plant trees of the usual description from the nursery, and by others to plant the acorns; but having no experience of the latter method, would be glad to learn your opinion on the matter, and if you approve of it, kindly add instructions as to the manner of doing the work, and oblige, SOMERSET.

The practice of rearing oak plantations from the acorn is not commonly resorted to, perhaps not so much so as it should be in particular circumstances. We have seen excellent results follow the practice when it was gone about well, and when the soil was good, which it appears to be in our correspondent's case. Much depends on whether the land is clean, or if cleaning may or can be properly attended to during the second and third year after planting, as to the ultimate success of planting the acorns where they are to grow permanently. There will not be so much necessity for cleaning the first year if our instructions are carried out, and after the third year they will defy the power of weeds. Our correspondent says nothing about shelter, which is an important condition of success in such a project, for it certainly would not succeed well if the ground is much exposed to wind in spring and early summer. But assuming that it is fairly sheltered, we would proceed as follows: Let the ground be marked off in rows five feet wide in the direction of its fall or slope, and dig each row from end to end, one spit deep and one spit wide, turning the grass top downwards and breaking or cutting each spit with the spade. Then dig a drain midway between and parallel with each row, about 18 inches wide and one spit deep, laying the earth on the top of the newly dug row, the turf side downwards, and breaking each spit roughly—finish the drains by clearing out the broken earth and laying it also on the top of the ridge formed by the soil thus accumulated on the line of the row, which will then be fully prepared to receive the acorns. The advantage of this method is that it increases the actual depth of the soil in the position which the trees are intended to occupy, while the shallow drains aided by the increased elevation of the rows will draw off the surface water and secure a comfortable bed for the seed. Before planting the acorns, give them a good coating of red lead to make them noxious to birds and mice. To do so thoroughly, put them into an old copper, wet them well, and immediately sprinkle them over with red lead, and move and turn and keep them moderately moist till they have taken up the whole of the colouring matter and become a good bright red. Allow them to dry a little and then plant with a blunt dibble similar to that used in planting potatoes, placing them two or three in each hole, and about 2 feet apart from hole to hole, covering them about 1½ inches. The planting should be done as soon as the acorns are ripe, if possible, as they often lose vitality if they are kept over till spring out of the ground; but if to be obtained fresh, they may yet be planted this season. If there are crows in the neighbourhood, a watch should be placed when they begin germinating in spring, as these gentry are not easily deterred from destroying them even by such a coating as red lead. If all the conditions are favourable, oaks reared in this way will outstrip in five years those that are twice their age, while the cost of planting will be considerably less.—ED.

MISCELLANEOUS.

In the grounds of Steephill Castle, Ventnor, a large tree of the *Araucaria imbricata* species, familiarly known as the monkey-puzzle, is in full bloom, an occurrence exceedingly rare in this country. The tree, which is about 40 feet high, contains nearly 40 cones of fruit. These cones are twice the size of ordinary cocoa-nuts, and the exhibition of one of them at a local flower show excited great interest, neither gardeners nor other visitors having ever heard of the tree blooming in England. At East Dene, near Ventnor, there has been in full bloom the whole season a palm, a native of China, known as *Chamærops Fortunii,* which is essentially a native of the tropics.

Platanus Orientalis.—This plant is used by the Turks as a memorial tree, more particularly on the occasion of the birth of a son. In the court of the Seraglio at Constantinople is or lately was a venerable specimen, which is traditionally believed to have been planted by Mahomet the Second after the taking of Constantinople, to commemorate the birth of his son, Bajazet the Second, the trunk of which is 50 feet in circumference. But there is one spoken of at Buyukdere, on the Bosphorus, which is 45 yards in circumference, but it is not very clear whether this is the measurement of the fourteen large trunks, into which the main stem divides at a certain distance from the ground, or the parent stem itself.

Causes of the Decay of Australian Forests.—This was the subject of a paper lately read before the Royal Society of New South Wales, by Mr. P. M'Pherson, M.A. He was first led to investigate this matter by noticing large numbers of gum trees, dying and dead, in the forests about Meredith in Victoria, and his observations extended from 1862 to 1874. A number of reasons had been advanced to account for this decay, including drought, bush fires, sheep manure and white ants. He thought that, though each of these might to some extent be responsible for the death and decay of trees, yet their operations were of too limited a nature to solve the difficulty. An aboriginal had told him what was apparently the true cause of death, viz., the ravages of opossums. From experiments which he had made, he found that an opossum would eat two hundred leaves (gum leaves preferred) in one night. On the trees in the forests were marks which showed conclusively that opossums were the cause of decay. As in past times the aboriginals fed on opossums, the animals were kept under; but now they were permitted to increase, and this seemed to indicate one principal reason for the depredations on the trees of late years.

THE FORESTS OF CANADA.—With the assent of Lord Derby, when Colonial Secretary, to a suggestion of Lord Lansdowne, the Governments of the various provinces of Canada were last summer applied to for information as to the condition of their respective forests. The replies received, which have been submitted to the Imperial authorities, showed that in Prince Edward Island the settlers and lumbermen had left little of value. In Nova Scotia the supply of pine and spruce was disappearing, and much of the heavy birch had been exported in recent years, but a fair quantity of hemlock remained. With stringent regulations against forest fires, and against the cutting of trees of less than a certain diameter, Nova Scotia would continue to be a timber-exporting region. Little information was gleaned regarding New Brunswick. In the province of Quebec a considerable quantity of timber remained above the north shore of the St. Lawrence, where, however, proper precautions were necessary. In Ontario and the other provinces reports were of a similar nature; and in Manitoba the formation of an active forestry association was welcomed to enforce rigidly the existing legislation on the subject. To the statements that the forests of British Columbia are within six years of exhaustion, the authorities return an energetic and complete refutal.

UTILIZATION OF BEECHMAST.—In a pamphlet written by Captain L'Estrange, and published by Hodges, Dublin, it is pointed out how a very considerable profit is made in France out of this common produce, which in this country is entirely neglected and left to the wood pigeons. Captain L'Estrange's researches on this subject have been aided by the Foreign Office, who have obtained information from the British Chamber of Commerce in Paris that the oil from the beechmast is now selling at 10 francs the kilo, and that from the tariff of the French "Commission des Valeurs" the refuse after the oil is extracted is worth twelve centimes the kilo. It is stated that a cwt. of nuts will produce 7 kilos (about 14 lbs.) of oil, worth at the present price £3, 10s. According to this, a ton of beech nuts would be worth £40. The oil when prepared is of an amber colour; it has no smell, and a very delicate flavour, and supplies the place of olive oil; but it keeps better, improves with age, and will keep for more than twenty years. It is evident from this that not only would very considerable profit be made out of this product, which now goes to waste, but it would afford plenty of employment to women and children in collecting the crop. Captain L'Estrange suggests that some of our patriotic, scientific, or agricultural societies might make an experiment on a few cwts. of nuts, and if the experiment proved a success the industry might be successfully started, and would undoubtedly in that case be of great profit and utility.

A NEW industry in the southern forests is the utilization of the needles of the long-leaved pine. The leaves are soaked in a bath to remove the glazing, and then "crinkled" for stuffing cushions or other upholstering purposes. They are specially valuable on shipboard and other places where furniture is in danger of becoming infested with insects. The turpentine which remains in the leaves makes a most inhospitable abode for these annoying visitors.

ENORMOUS CONTRACTS IN SYLVICULTURE.—Speaking of the extensive planting operations by Government in South Australia, an American paper says:—"One and one-third million of trees are a good many, and all these planted in eight years! But we know of one firm that has planted during five years 2,720,000 timber trees in a single county of Kansas, aside from the millions they have grown elsewhere. It may be added that not only did this single firm furnish all these trees and take the contract to plant them, but agreed to care for them and deliver them over standing six feet high and four feet apart, established, shading the ground and able to take care of themselves. We are not doing as much work in sylviculture as our rapidly vanishing forests warn us that we should do, but we are doing a great deal, and doing it well. This plan of contracting to care for the young forest seedlings during their critical early years, and delivering them only when they have become lusty saplings, capable of maintaining themselves, is an American novelty. Persons desiring to make forest plantations on a large scale, can in this way insure themselves against loss by a guarantee that their young stock will have the most intelligent care when such care is most needed."

THE BABYLONIAN WILLOW (*Salix Babylonica*).—This the most elegant of all the willows, is very abundant in the Levant, which is said to be its native habitat; but it is so abundant in all parts surrounding that region, that it may be questioned where its habitat ends. There is no doubt its introduction into Britain is of comparatively recent date, and if popular legend may be relied upon, the credit of having first planted it is due to the poet Pope under very odd and purely accidental circumstances. The poet, it is alleged, received a present of figs from Turkey, a much greater rarity in those days than now. It was observed by Pope that one of the twigs forming the basket in which the figs were received was budding, and being anxious to have a memorial of the gift more enduring than itself, he planted the twig in his garden at Twickenham on the Thames. It flourished and became a historical tree, and the alleged parent of all trees of its kind in Britain. It would be a pity to dispute this pleasing legend, and it was equally a pity the *Vandals* should have laid their hands on the tree itself about fifty years ago, and hewed it to the ground. It is further said that this is the willow celebrated in holy writ, in the lamentation of the daughters of Israel during the Babylonian captivity, when, " By the rivers of Babylon, there we sat down, yea, we wept, when we remembered Zion; we hanged our harps upon the willows in the midst of them." Whether this is true or otherwise, the tree is very suggestive of weeping, and is in this and other countries the chosen emblem of grief.

THE LEAVES OF PLANTS.—A writer in one of the leading monthly scientific journals says:—It is generally supposed that in autumn the leaves drop off because they die. My impression is that most persons would be very much surprised to hear that this is not altogether the case. In fact, however, the separation is a vital process, and, if a bough is killed, the leaves are not thrown off, but remain attached to it. Indeed, the dead leaves not only remain *in situ*, but they are still firmly attached. Being dead and withered, they give the impression that the least shock would detach them; on the contrary, however, they will often bear a weight of as much as two pounds without coming off. In evergreen species the conditions are in many respects different. When we have an early fall of snow in autumn, the trees which still retain their leaves are often very much broken down. Hence, perhaps, the comparative paucity of evergreens in temperate regions, and the tendency of evergreens to have smooth and glossy leaves, such as those of the holly, box, and evergreen oak. Hairy leaves especially retain the snow, on which more and more accumulates. Again, evergreen leaves sometimes remain on the tree for several years; for instance, in the Scotch pine, three or four years; the spruce and silver fir, six, or even seven; the yew, eight; *A. pinsapo*, sixteen or seventeen; *Araucaria* and others, even longer. It is true that during the later years they gradually dry and wither; still, under these circumstances, they naturally require special protection. They are, as a general rule, tough, and even leathery. In many species, again, as is the case with our holly, they are spinose. This serves as a protection from browsing animals; and in this way we can, I think, explain the curious fact that, while young hollies have spiny leaves, those of older trees, which are out of the reach of browsing animals, tend to become quite unarmed. In confirmation of this I may also adduce the fact that while in the evergreen oak the leaves on well-grown trees are entire and smooth-edged like those of the laurel, specimens which are cropped and kept low, form scrubby brushes with hard, prickly leaves.

PRESERVING FENCE TIMBER.—Considerable trouble and expense are often incurred in the attempt to render fence posts and other timber for fencing purposes more durable by coating them with petroleum or other applications in vogue for that purpose. The object is a good one, and when properly gone about the practice is successful. It matters less what sort the timber to be employed may be than the condition it is in when operated upon with the view of increasing its durability. Before applying anything to it to prevent rot, it should first be thoroughly seasoned. If the natural sap is still in the timber, it will prevent the perfect absorption of the application, and that, on the other hand, will prevent the escape of the sap, which will ferment and induce immediate decay. It were better and cheaper to leave such work alone than perform it in this manner. Yet the material for fences is not unfrequently felled, sawn, and erected and dipped in or coated with the preservative composition, whatever it may be, within a month of the conception of the work. In cases of emergency, if seasoned posts are not handy, it would be more rational practice to well but very slowly char the end that is to be placed in the ground of the fresh cut ones, to the extent of one foot more than will be buried, then cut the loose charred surface off all round and apply the preservative composition. This is really the foundation of the fence, and some care as well as skill is necessary to lay it well. A good fire should be made on the ground of chips and billets, so as to get up a big mass of ingle not in blaze. Over this the ends of the posts should be placed not in contact with the fire, but close enough to act strongly. The fire should be attended to closely so as to keep it effectively up, and the posts should be turned occasionally so as to bring all sides directly under the influence of the heat. When the posts cease to give off vapour, they should be cleared of the charred surface and dipped before they are cool in the petroleum or tar, or whatever it is intended to apply as a preservative. Having thus laid the foundation, the building of the fence may proceed at once; the rails and bars will season as they stand, and may be coated with the preservative at convenience any time after they are considered in a fit condition to take it in properly. The perfection of the charring process is that the timber should not be reduced in bulk in the least possible degree, there should be no waste, but the drying must be thorough to the core.

VEGETABLE MONSTROSITY.—During the time of miscellaneous contributions at the last meeting of the Botanical Society of Edinburgh, a curious branch of a tree was shown through the Rev. Mr. Tennant, containing vegetable growths along the sides, and each of which had a stone imbedded in its centre. It was picked up at some depth in a cutting made for the recently opened Edinburgh and Suburban Railway.

HOW PUBLIC TIMBER GOES IN AMERICA. — We learn from a correspondent in one of the American timber trade journals, that Congress in its stupendous goodness a few years ago enacted a law which gave to settlers and miners permission to cut on public land what timber they needed for domestic use and mining purposes. Along the Northern Pacific line in Montana and on this side, vast tracts of useful timber existed, and a few on the inside of the ring organized and commenced the wholesale slaughter, and for several years past have done a regular "land office business." As soon as the determination of Commissioner Sparks to stop this work was made known, the thieves set up an immense howl, and claim that unless they are allowed to proceed with this pillaging, all Montana will be bankrupted, and all industries will have to suspend. The latest advices from Washington indicate that unless Congress interferes, the rascals will be made to pay for what they have taken and stop. As it will be understood that the whole power and influence of the Northern Pacific Company and the big mining companies will be worked, our readers may not be astonished to hear that they have been literally given all the timber growing along the mountains. The exact point is, that by some inside arrangement, no person outside this company can ship timber or lumber over the lines, and hence they have a monopoly of the stealing. If Montana is obliged to suspend operations, or pay for the timber stolen from the public lands, let her suspend.

PACIFIC FORESTS AND RAINFALL.—It appears from the American Census Report that the forests of the Pacific region owe their density and position to the character of the rainfall, which upon the northern coast is unequalled by that of any other part of the continent. This rainfall diminishes with the latitude, until in Southern California the temperature of the land so far exceeds that of the ocean that precipitation is impossible through the greater part of the year. The coast range and the Sierra catch most of the rain, and are well wooded, while the valleys are treeless. On this coast the general distribution and density of forests follow the distribution and amount of the rainfall. The forests of the Pacific region are, first, the Northern Forest, extending from the 70th to the 58th degree of latitude. The principal trees of this division are the white spruce, and the most important species of the North Atlantic region, the canoe birch and the balsam fir, are replaced by allied forms of the same genera. The Coast Forest, the heaviest but not the most varied, of the continent, extends in a narrow strip along the coast from the 60th to the 50th parallel, where it widens and extends eastward, and then follows the summits of the Sierra Nevada almost to the Mexican boundary. This forest is composed of a few coniferous species. The absence of broad-leaved trees on the Pacific coast is striking. The most valuable woods of the Coast Forest are the Alaska cedar, the tideland spruce, the hemlock of the north, and the red fir. The Coast Forest of California is divided into three sections—the forest of the coast range, that of the western slope of the Sierra, and the open forest of the valleys. The important feature of the Coast Forest range is the redwood belt, whose heaviest growth is found north of the Bay of San Francisco. No other forest of similar extent equals in amount of material the groups of redwood along the California coast. The forest of the western slope of the Sierra is surpassed in density only by the redwood belt. Its characteristic species is the great sugar pine, and it is situated between 4000 feet and 8000 feet elevation. It extends from the base of Mount Shasta to the 35th parallel, ceasing near the boundary of Mexico. The forest of the valleys is composed of scattered oaks. East of the Sierra and reaching to the Rocky Mountains is the Interior Forest, whose trees are the least valuable of all.

CHIPS.

RUSSIAN FORESTS. — In Russia the Government owns 330,000,000 acres of woods, and other parties 150,000,000. About 40 per cent. of the country is timbered. The Government woods have been placed under the care of the Forest Department, and the organization of the service is very complete. There are two schools of Agriculture and Forestry, one at St. Petersburg and one at Moscow.

GERMAN FOREST LANDS.—The returns recently made of the forests of Germany show an increase since 1878 of 152,546 acres, a result brought about by replanting and wooding commons and waste lands. The ground occupied by timber is now estimated at 26-100ths of the empire, out of which the fir and pine culture claim upwards of two-thirds, the remainder being apportioned to oak and other hardwood trees.

There are 20,000,000 acres covered with timber in the timber belt of Washington Territory.

Great Britain imports forest produce from its colonial possessions to the amount of £30,000,000 a year.

Dr. Uredale, the botanist, and master of the Grammar School at Enfield, more than two centuries ago planted a cedar there, which he brought from Lebanon. It was at one time thought to be the finest specimen in England, being over twelve feet in circumference at the base.

According to a contemporary, the loss to the United States through forest fires is now not less than 300,000,000 dollars a year, a sum nearly equal to the interest on the public debts of all the civilized nations of the world, through the carelessness of boys and hunters.

To remove Tree Stumps.—In autumn or winter bore holes, 1 inch in diameter and about 6 inches from each other, in the stumps, and fill with saltpetre. On a dry day in the following summer set fire to them. The moisture dissolves the saltpetre, which, impregnating the wood, causes it to smoulder.

Canadian Lumber in Europe.—The Antwerp Universal Exhibition promises to be most effective in promoting the exportation of Canadian lumber. The exhibits of the Canadian products have attracted the attention of Belgian lumber merchants, and large orders have already been received from Belgium through the Belgian consul at Quebec.

Swiss Forests.—In Switzerland the waste of forest has been more rapid and destructive than in any other country in Europe. Public attention is, however, thoroughly aroused, and tree-planting is encouraged in all the cantons. The same is true of the forests in the British Isles.

The divining rod, sometimes used by well-diggers, and at an early date by oil-prospectors, is a popular fiction that dates back to the eleventh century.

Pinus Pinea is very common on the islands of the Sea of Marmora, and the cones are gathered and sold in the markets for the sake of the seeds, which are eaten by the Turks, and called *fistik*. In order to extract the seeds, which are large, the cones are exposed to fire, when they open and permit the nut-like seeds to fall out.

The writer who says that our hope of a future timber supply does not lie in the direction of preserving the old forests, but in producing the new, comes pretty near hitting the nail on the head. Little good can come from allowing timber to stand until it has passed its best days and begins to decay and lose strength. It is not the "primeval," but the young forest, which needs protection.

The strongest wood in America, says Professor Sargent, is the hickory of the Arkansas region, and the weakest the West India birch. The most elastic is the tamarack, the white or shellbark hickory standing far below it. The least elastic and the lowest in specific gravity is the wood of the *Ficus aurea*. The highest specific gravity, upon which in general depends value as fuel, is attained by the bluewood of Texas.

Hanover Forestry.—In Hanover there are 900,000 acres of forest, under Government or State management, belonging to the church and to municipalities. The care and working of these forests cost about £130,000 annually. The receipts therefrom are £300,000, and the profit is about £170,000. The officers in charge are a forest director, an over-forest master, 20 forest masters, 112 over-foresters having charge of districts of seven or eight thousand acres each, 403 assistant foresters. A systematic plan for the management of the forest is adopted.

FORESTRY

FEBRUARY 1886.

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EDITORIAL NOTES.

CLOSE AND OPEN FOREST PLANTING.—In order to test the advantages or disadvantages of planting at various distances, some experiments were instituted in Germany some twenty-five years ago, and the results have recently been made known. An area of about fifty acres of the same average quality of soil and the same exposure was planted, in ten-acre portions, at distances ranging from four feet by four feet to twelve feet by twelve feet. Careful measurement has recently been made of the timber in each plot, and the following table is alleged to show the results in each case:—

Width of Planting.	Average Accretion in the 25th Year.
4×4 feet	181·4
6×6 „	152·3
8×8 „	137·3
10×10 „	136·4
12×12 „	112·9

It would appear from these figures that the crop decreases in proportion as the width between the plants is increased at planting time. But there is much besides this meagre statement of the results at twenty-five years after planting required to enable us fully to understand the value of this important experiment in arboricultural practice. The management of the several portions of the fifty acres under experiment during the twenty-five years must form an indispensable factor in coming to any conclusion as to the value of these figures, which are put forward as the ultimate result of the comparative experiment.

THE RELATION OF HEARTWOOD TO SAPWOOD.—It is a common and rather loosely held opinion that the formation of sapwood into heartwood in trees is not a gradual and concurrent process, but that it begins at a certain age in the same species invariably; modified only in a trifling degree by the differences of soil and climate as they may affect the growth of individuals. Thus the larch, for instance, must attain a certain age, no matter what the differences of soil and climate under which it is grown, before it begins to form heartwood. It matters not whether the growth be rapid or slow, heartwood must appear at or within a brief period of its arriving at a certain age, varying only in point of time in proportion to the difference of soil and climate as exerted on the individual during its period of growth. In a colloquial sense, it may be admitted there is a general foundation of accuracy in this commonly recognised opinion. No doubt the individuals of a species, such as the larch, or any other grown in the same soil and other circumstances, on attaining a certain age will present relative proportions of heartwood to sapwood sufficiently close to establish the general conclusion. But this is merely stating in other words the fact that it takes so many years to bring the individuals of a particular species to maturity. What is really meant by the statement that heartwood begins to form at a certain age in any tree is simply that it has become visible, and presents a marketable quantity in relation to the sapwood out of which it is formed. But this is a totally different thing to what is implied by the statement, and also as to what really takes place in the growth of a tree. The formation of heartwood, like that of sapwood, begins with the birth of the tree. The exercise of the functions leading to the building up of sap and other vessels which form the structure of the newly-born plant, is the point at which the formation of sapwood and heartwood alike begin, and the processes go on concurrently season after season. Not perhaps with invariable results in even the individuals of the same species; certainly not in all species alike. Some species are slow to exhibit the same relative proportion of heartwood to sapwood that others do. And this may, as a general rule, be taken as an index of the longevity of a species; those, such as the oak, which are slow in forming heartwood being longer-lived than most of the species of coniferæ which form their heartwood more rapidly, or in other words, arrive at maturity earlier. But the process of the formation of heartwood goes on concurrently with that of sapwood from the first development of the plant from the seed, whether growth be slow or rapid, whether maturity be arrived at in a few years or after many years. Briefly, the conversion of sapwood into heartwood is accomplished by the thickening and indurating of the walls of the sap vessels, and by the deposition in them of the peculiar secretions of each species, such as gums, resins, etc., resulting from functional action, by which they eventually become filled up, and their original use as channels for the upward flow of the sap ceases. The time required to complete the process varies in different species, and even in individuals of the same species, according to circumstances already alluded to as affecting comparative rapidity of growth.

THE FORESTRY COMMISSION OF THE STATE OF NEW YORK has recently issued a very comprehensive and elaborate report, in which great prominence is given to the necessity for legislative enactments giving greater security to the owners of forest lands, and providing for the prompt punishment of trespassers. Speaking of forest fires, which cause such lamentable destruction in the Adirondack forests, the report says: "They do more than consume timber; they change the nature of the surface soil, and deprive it of the ability to produce a second growth of the trees which they destroy. When the maples, beeches, and pines of the forests are burned, these trees do not soon recover the soil; these for the time give way to poplars, wild cherries, and other inferior trees of no economic value. This new growth, unless destroyed by fire, is in time followed by another, in which appear trees of the species which composed the original forest. Such a rotation of forest crops, however, necessarily occupies a long time, and years must elapse before a forest destroyed by fire can, even under the most favourable conditions, be replaced by a new forest of similar composition. Land, however, upon which the timber has been destroyed by fire rarely escapes subsequent burning. A second fire runs more easily and rapidly than the first over the ground cleared of its protecting covering of undergrowth, and finds abundant fuel in the half-charred trunks which the first fire only partially consumed. Each subsequent fire spreads more rapidly and easily, the surface soil is gradually rendered unfit to produce plants of any sort, or is washed into the streams; rocky slopes are laid bare, and whole regions, once valuable in the forests which they supported, are made worthless for ever."

In reviewing the home-grown timber trade of 1885, *The Timber Trade's Journal* speaks rather more favourably than of the trade in imported timber. The cause for this is not far to seek. There are certain uses to which it is impossible to put satisfactorily any but English timber, and however severe the competition with foreign material, it will have no effect on the market for English wood. If the supply is in equipoise with the demand—and on the whole this has been the case in 1885—the market is sure to be steady.

The greatest consumers of English timber are of course the railway companies, who take large quantities of elm, beech, and especially oak. The wear and tear of their rolling stock necessitates its constant renewal, and nothing stands the strain to which every coal and goods waggon is put like English oak; and so large is the quantity of home-grown timber absorbed in the manufacture of these, that it may be safely said, barring any unforeseen and unusual incidents, that according to its demand by the railway companies will be its price.

Next in importance as consumers may be mentioned the wheelwright and coachbuilder, who have to supply the means for the vehicular traffic of the country. The agricultural implement maker then follows, and here, owing to the depressed condition of agriculture, we have to record a slackened demand.

The agricultural depression has, however, also affected the English timber merchants in another way, and it may be said that in 1885 the two influences neutralized each other in their bad effects. Landlords have found rents to depreciate, and consequently have been obliged to fall back on their timbered lands for the deficiency,—though on a well-managed estate timber should be cut every year; and had it not been for this circumstance, English timber merchants would have had to pay a higher price for their wood, as in the market of 1885 there was not, as there had been in previous years, a large quantity of blown timber, the old stocks of which have now nearly vanished. And, finally, as a channel of consumption, we may mention boat and barge building.

The war scare proved a boon to the English timber merchant,—as for ambulances, waggons, gun-carriages, boats, etc., large quantities of wood were required, and the stocks in the yards about April were completely cleared to meet the demands of the Government. This was a sort of counteractive to the lessened requirements in other quarters, and for this fact and for the reason that only English timber, as we have already mentioned, is applicable in certain uses, prices have not depreciated in the same degree as for foreign wood, and stocks are much lower, especially spokes. On the whole, the volume of trade may be said to have pretty closely corresponded with that of 1884, though in some cases, perhaps, slightly lower prices have had to be accepted.

OUR contemporary, *The Indian Forester*, for December, contains a "Memorandum on the Colonial and Indian Exhibition, to be opened in London in May next," which furnishes some interesting data as to what may be expected in the shape of exhibits of forest products from India. His Royal Highness the Prince of Wales, who is taking a deep interest in the matter, writes, in a letter enclosed in a despatch from the Secretary of State for India, in February 1885:—"Much interest is taken in this country in the woods of the various colonies and dependencies of the Crown; and I shall be glad if a good representation of those of India is made."

It appears, however, that the floor-space allowed for the entire Imperial Court amounts only to 4240 square feet, with a wall-space of 5910 square feet. For the Forest Department, 3500 square feet of this total space has been asked, but it has been found impossible to grant more than 400 square feet. In these circumstances, so complete and varied a collection of timbers as might have been exhibited had space been more ample cannot be made, but it is considered a fairly good collection may be accommodated in the allotted floor-area. As now arranged, it appears the space named will be exclusively devoted to specimens of timber, and that other forest products, such as gums, dyes, tans, fibres, etc., will be grouped in other departments of the Imperial Court.

It is proposed that a special trophy be devoted to "Bamboo and its uses." The form will probably be that of a bridge thrown over one of the transverse paths of the Imperial Court, and connecting two of the sub-courts. The bridge would be constructed after the manner of a rustic bridge, and designed so as to illustrate the numerous forms of bamboo itself, and the multitude of objects made of bamboo, such as fishing-baskets, knives, spoons, and musical instruments. On the pillars of the bridge, convenient recesses would be constructed to receive glass jars containing edible portions of the bamboo, such as bamboo-grain and bamboo-shoots; the latter boiled as asparagus or preserved as *Chow-chow*, and *Tabashir*, or the crystalline substance obtained from the interior of the bamboo culms. Bamboo paper fibre and bamboo paper might also be exhibited in the same connection.

Fibres will be exhibited in two sections—first, fibres suitable for the textile industries, that is, ropes and fabrics; and, secondly, fibres suitable for paper-making. Under each of these sections may be presented new substances for the purposes named.

Gums, resins, extracts, and gutta-percha and caoutchouc will be largely represented, and considering their immense importance in the arts, science, and commerce, cannot fail to attract much interest. In this connection it is recommended that dried samples of the plants from which both gums, etc., and fibres are obtained, should be exhibited along with the raw or prepared products. This would obviously greatly increase the value of the exhibits, especially as regards their accurate identification.

Under the heading "Extra Forest Products," it is proposed to include all wild fruits, leaves, roots, or other matters eaten regularly, or in time of famine only, by the poorer people; also all fodder grasses, bushes, or trees. Bees, hives, honey, wax, and ants will also be brought under the category of extra forest products, all of which we learn from the Memorandum are receiving much attention in India at present. It is proposed to show a collection of Indian ants, some of which are regularly eaten by the hill tribes; and it will be attempted to add to the interest of this subject by exhibits of ants' nests and hillocks in their complete and natural condition.

On account of the increasing demand for silk, efforts are being made, under the extra forest products section, to bring together a complete collection of silk-worms other than the mulberry silk insect, with the view of increasing the source of supply; and the Revenue and Agricultural Department offers to place special funds at the disposal of forest officers who will give this subject their special attention.

IRON *versus* WOOD RAILWAY SLEEPERS.—At a Railway Congress recently held at Brussels, the question as to the economy and desirability of employing iron in the place of wooden sleepers for railways was discussed. The Congress was fairly representative of railway interests in all parts of the world. It was stated that iron sleepers were being used in Holland and in India to a large extent, and to a more limited extent and experimentally in England and Belgium and other countries. In India and in Holland it was considered that the result of the experiments was satisfactory, especially in the former country, where white ants make such havoc of the wooden sleepers. In Egypt, on the other hand, it was not considered that iron could be advantageously employed for the purpose, owing to the rapid corrosion of it when brought in contact with sand. The cost of iron sleepers it was found was much higher than that of wood; they required superior ballast, and it was considered that experience as to their duration and maintenance was insufficient to enable the Congress to come to a specific conclusion regarding their actual economy and general fitness as a substitute for wooden sleepers.

REPORT OF THE SELECT PARLIAMENTARY COMMITTEE ON FORESTRY.

THE proceedings of the Select Committee appointed in last session of Parliament to inquire into the state of forestry in this country, and the desirability of establishing a Forestry School in Great Britain, has been embodied in a rather lengthy report. It contains little bearing on the subject that was not already known to those who have given it their study and attention. It may be regarded as an epitome of facts and opinions which have been given within the past few years in forestry reports and other writings bearing on the condition of forestry at home, in India, and in our colonies. Among the witnesses examined before the Committee are some whose names are identified most closely with forest conservancy, sylviculture, and forestal literature. All are most earnest advocates of an improved system of education for foresters both at home and for our possessions abroad, and have contributed largely to the furtherance of that object. Mr. W. G. Pedder, Dr. Cleghorn, Colonel Michael, Colonel Pearson, and Professor Thiselton Dyer all gave valuable information in their examination before the Committee, and presented as it is in the handy form of the report, it will be of great value to the general public and all whose access to general literature on forestry matters is limited.

The subject of forestry and forest products embraces a much wider field than the mere production of timber, though that is the leading idea which presents itself to the minds of those whose interests do not lead them to study it closely in all its bearings. The important influence of forests on climate, shelter, and water supply, their value as a source of labour or employment for the poor, and the immense amount of commercial resource they yield in the shape of resins, gums, oils, fuel, etc., all constitute these possessions of the highest national importance, and entitle them to the careful consideration of the Government, with a view to their conservation and improvement where they already exist, and their increase wherever it may be desirable and practicable.

It is only within the last thirty or forty years that attention has been given by the Government to the conservation and utilization of the immense forest areas that we possess in India and other of our dependencies, and although the progress has been slow and halting, yet it has been, on the whole, progressive. One great obstacle has been the difficulty of obtaining properly qualified men, either natives or Englishmen, to superintend and manage the great interests at stake efficiently. Our system of forestry education at home was too limited in scope, and had too much of the rule of thumb character in it, as applicable to the needs or requirements of this country, to qualify the ordinary practitioner to discharge the duties of a responsible forest officer in India. Up till ten years ago it appears from Mr. Pedder's evidence that we were accustomed to send our forestry students in training for India to Nancy, with the result that, as most of them entered on their course of studies there in ignorance of the language, a large amount of their time was wasted, and the benefits of instruction minimized. Now, the system is that five to seven or eight students for training in forestry subjects are admitted annually to the Royal Engineering College at Cooper's Hill, and receive special instructions in botany, forestry, and sylviculture in addition to other subjects bearing on and required in the responsible positions they aspire to. The great drawback to this system is the absence of practical instruction in the field, or rather in the forest, whereby the teaching in the classroom may be illustrated. On this point Colonel Pearson expressed himself in favour of the founding of a Chair of Forestry at the Edinburgh University, but remarked that he had no actual faith in lectures in the school except they were also illustrated by practical instruction. "If," he said, "you tell a man in the lecture-room that such and such consequences will take place, and do not show him the consequences on the spot, he does not believe anything about it; it goes in at one ear and out at the other; he will think it all nonsense; but if you want to impress your teaching upon him, you must take him out into the forests and show him the operations of nature." Regarding this it may be said that very much would depend upon the previous experience and attainments of the student. If he has come direct from school, and has had no experience of forestry practice, no doubt lectures in the classroom would be of little benefit to him without practical illustration. But if he has had general practical experience in forestry work in this country, and is somewhat acquainted with the literature of the profession, he will not fail to profit by the lectures even in the absence of practical illustrations in the forest. A forestry school with the practical facilities that attach to those on the Continent is impracticable in this country; that is a point that may be conceded at once as likely to remain for ever an impossibility. But is it required, or rather is it an indispensable necessity? We think not. We could not, even with the most complete educational machinery that exists on the Continent, qualify young men in a two or three years' course at school to enter on responsible positions immediately on the completion of that course. They must afterwards pass through a probationary course in some subordinate capacity, giving them opportunities for applying their theoretical acquirements and enlarging their experience. If they aspire to positions in India or the colonies, let them go there and be placed under chiefs who may be presumed to be capable of developing their theoretical acquirements into ripe practical experience. On the other hand, if they elect to stay at home they will find abundant scope for reducing to practice their school lessons in the capacity of foremen, and eventually aid in raising the position of practical forestry in this country to a higher level. In reference to the establishment of a Forestry School, Dr. Cleghorn gave it as his opinion that improvement of forestry and sylviculture in this country was impossible without it.

The report, while admitting the difficulty as to time and place that stands in the way of the creation of a Forestry School in this country, advises the immediate adoption of the principle, and recommends that a National School of Forestry be founded in Great Britain, and that professorships of sylviculture be instituted at Cooper's Hill and at Edinburgh University.

The late period of the session at which the Committee was nominated rendered it impossible to complete their investigations, and they recommend that a Committee on the same subject be appointed in the next session of Parliament.

PRACTICABLE ARRANGEMENTS IF GOVERNMENT AID SHOULD BE REQUIRED IN THE ESTABLISHMENT OF A NATIONAL SCHOOL OF FORESTRY IN EDINBURGH.

BY THE REV. J. C. BROWN, LL.D.

IN a preceding number I have stated my views in regard to the eligibility of Edinburgh as the site for a National School of Forestry; and I there mentioned that at a meeting held in the close of the year by the committee appointed at a Conference held in 1884 in the International Forestry Exhibition, to take measures for the establishment of such a School, the members present were unanimous in a resolution to endeavour to raise £10,000 for the endowment of a Professorship in the University. By some it may be considered that such a professorship would be all that would be necessary; by others it may be considered that the establishment of such a professorship might be an important point of departure towards further arrangements for securing complete provision for the education, instruction, and training of English-speaking students in forest economy, in accordance with the most advanced forest science of the day—arrangements to be made, if thought desirable, at some future time, if not at present; but whether deemed an arrangement which is good, bad, or indifferent—whether likely to yield all that may be anticipated by the most sanguine of its advocates, or one open to the objections of the most lukewarm of its supporters—it was the only scheme in regard to which the co-operation of all the members of the committee could be secured; and with united voice they agreed to make a renewed appeal to all whom it may concern to supply the necessary funds.

But there is a contingency for which we should be prepared. It is possible, and more than probable, that the amount required may not be supplied by the voluntary contributions of those who are interested in the matter. As soon after their appointment as practicable, the committee issued an appeal to noblemen and gentlemen, landowners and others having a personal interest in plantations, woods, and forests, for subscriptions towards the fund required; but the subscriptions received in response only amounted to £360, inclusive of one of £100 by the Earl of Wemyss, and one of £50 by Mr. Robinson, of Westwood Hall, in England; the Scottish Arboricultural Society subsequently added a subscription of £50, and the Magistrates and Council of the city of Edinburgh one of £250, about £660 in all, but £10,000 were required. Within six months after the issue of that appeal the committee issued a second appeal; but nothing more has been received.

With the commencement of this year they have issued a third appeal, with what results it remains to be seen. It would be rash to speak of what may probably be subscribed in answer to this appeal; but looking to the amount of subscriptions obtained since the close of the Exhibition a year and a half ago, I do not think it likely the amount required will be realized soon unless Government aid in the enterprise by a liberal contribution, given spontaneously or otherwise. And should this be done, or in any case, it is open to question whether the subscriptions which have been procured may be considered available without renewed authority from the donors, seeing that they were obtained for the purpose of establishing a School of Forestry, with a Museum attached, which scheme has been abandoned—and what is now proposed is the endowment of a Professorship in the University. Should Government aid be given, either in response to an application from the committee, spontaneously, or on the suggestion of others, this new element would somewhat complicate the matter; and in view of this possible contingency, there is another aspect of the question deserving attention.

Last year, on the motion of Sir John Lubbock, a Select Committee of the House of Commons was appointed to consider whether, by the establishment of a School of Forestry or otherwise, our forests can be rendered more remunerative. They took evidence, and reported, suggesting that in the new Parliament there should be appointed another committee to complete the inquiry. The House of Lords sent a message to the House of Commons requesting to be furnished with a copy of the evidence; the British Association for the Advancement of Science, at their meeting in autumn, also appointed a committee for the purpose of considering whether the condition of our forests and woodlands might not be improved by the establishment of a School of Forestry; and it may be the case that before the committee appointed at the Forestry Exhibition may be in a position to carry out the work with which they were entrusted, their work may be superseded by Government action. The committee were unanimous in their decision to do what they could to raise money to secure the endowment of a Professorship of Forestry in the University of Edinburgh, this being the only scheme practicable by them for the accomplishment of the duty entrusted to them. But in view of the possibility of the Government having to undertake the work, the question comes up: Assuming Edinburgh to be proved to be the most eligible site for such a School, is the establishment of a Professorship of Forestry in the University the most satisfactory mode of attempting what is desired? And on this point the committee were not unanimous, though they were on the other.

It would be unreasonable to expect that at once, and in all time coming, there could be found candidates for the chair qualified to give instruction satisfactorily in all the subjects comprised in what is known as forest science and forest economy, for the study of which no provision exists in the other classes in the University.* And the University, with only one chair appropriated to prelections on forestry, would not offer to students able and willing to meet all necessary expenses advantages equal to those of a fully-equipped

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* As stated in a previous article, p. 543, professional studies for which provision may be made, and for which *alone* it may be expedient to make provision in the school, may be arranged under the following heads:—

Part I.—

Forest Botany, embracing the structure, physiology, scientific classification, and natural history of herbs found in woods, and of arborescent shrubs and trees.

Forest Pathology, or diseases and the natural decay and death of trees.

Forest Mycology, or natural history of fungi found in forests, and of fungi injurious to trees and timber.

Forest Entomology, or natural history of insects injurious to forest products.

Forest Ornithology, treating of birds injurious or beneficial to the forests.

Forest Mazology, treating of quadrupeds, etc., injurious to forests.

School of Forestry. On the one hand, in these circumstances, many such might abstain from presenting themselves; and on the other hand, and this I deem of not less importance, there are many young men who have been familiar with trees from childhood, whose services it is of perhaps more importance to the State to secure—young men who may be willing to work if they could find employment in nurseries or gardens, and thus support themselves while attending classes. University class hours, however, are likely to be determined by other considerations than their convenience; and there are at present no such scholarships as are held with honour by students of divinity and others open to them, neither as yet are there of easy acquisition such remunerative engagements on the completion of their studies as are open to students of medicine and of divinity, whereby they might soon recoup the expenditure incurred in a residence at the University. With these two restrictions on the number of students, the attendance on the class would be limited, and from this it might follow that the professorship would become merely an honourable or respectable sinecure, giving the incumbent leisure for the prosecution of study and the publication of results when the demand for forestal literature may become such as would warrant this, with some probability that the expense of publication would be met by sales; and though the risk of this might be justifiable in a private endowment, it may be questioned whether it would be justifiable in an expenditure of public funds. It was with reluctance that some of the members of the committee gave up the idea of a School of Forestry, and substituted for this that of a Professorship of Forestry in the University. They were unanimous in their final decision; but this was not the only scheme discussed. It was formally proposed to send to the Science and Art Department of the Council on Education, South Kensington, copies of resolutions in favour of the establishment of a School of Forestry adopted within the last few months by the Arboricultural Society, by the Select Committee of the House of Commons, and by the British Association for the Advancement of Science, with a statement of our views of

Part II.—
- Destruction of Forests by Man.
- Forest Conservation in France and in Germany.
- History of Forestry.
- Advanced Modern Forest Economy.
- Sylviculture in accordance with Advanced Modern Forest Economy.
- Forestry of different Countries on the Continent of Europe.
- Forestry and Arboriculture of Britain.
- Improved Forestry in India.
- Treatment of Forests in British Colonies.
- Destruction, Conservation, and Extension of Forests in the United States of America.

the eligibility of Edinburgh as a site for such a School, and to submit for their consideration the expediency of their making arrangements for the study of forestry in connection with the Museum of Science and Art in Edinburgh, on terms similar to those of the Royal College of Science in Dublin, and of the Royal School of Mines and Practical Geology in London; or, alternatively, that we should make such a communication to the Governors of the Watt Institution.

And by some such measure, if the committee do not succeed in raising the £10,000 which they consider necessary for the accomplishment of that upon which they have agreed, it may be practicable to secure the advantages anticipated from a Professorship of Forestry in the University, together with others of scarcely less importance, without the disadvantages, or at least without some of the disadvantages, which have been mentioned, or others equally or still more to be deprecated.

For thoroughly efficient and satisfactory teaching in all the subjects of study enumerated in the preceding paper, and appended to this in a footnote, there would be required a staff of at least three teachers, one giving instruction in forest science; a second, in forest economy and sylviculture; and the third, in arboriculture and the management of woods and plantations such as are seen in Britain. But neither is it necessary to have so many teachers from the first; nor is it necessary to have only these, or no others until these may have been installed.

A commencement might be made with one teacher, and I had almost said, with a teacher in any one of these departments of study. Supposing a commencement made with a teacher of forest science. A teacher qualified for conducting the studies of a class satisfactorily in forest science would be one qualified for communicating instruction in both of the other departments; and with such instruction in these as might be given by him, the promoters and supporters of the School might rest satisfied till the necessity for an addition being made to the teaching power of the institution began to manifest itself. Then, another being added, the first would be relieved of having to give instruction in the department assigned to the new teacher, whether this should be one or other of those mentioned, or some one or more of departments of study comprised under the comprehensive designation Forest Science; and thereafter successive differentiations could be introduced as circumstances might require or warrant. It is questionable whether this could be done with a Professorship of Forestry in the University; but so far as appears, it might be done if arrangements were made for the study of forestry in connection with the Museum of Science and Art in Edinburgh on terms similar to those of the Royal School of

Mines and Practical Geology in London and the Royal College of Science in Dublin, which admit of expansion and curtailment and changes being made more easily than could be done with a Professorship in the University.

In the Normal School of Science and Royal School of Mines and Practical Geology in London under the Science and Art Department of the Committee of Council on Education, instruction was given in the winter session 1883–84, the latest of which I have a report, in chemistry, physics, mechanics, etc., mathematics, geology and mineralogy, biology, botany, metallurgy, mining, agriculture, and astronomy. In the summer course of 1884 instruction was given to students in chemistry, mechanics, including mechanical drawing, heat, metallurgy, hygiene, and agriculture; and lectures were given to working men in mineralogy, mechanics, and chemistry.

In the Royal College of Science in Dublin under the Science and Art Department of the Committee of Council on Education, instruction was given in the same session, 1883–84, to students of the first year in pure mathematics, elementary mechanics, descriptive geometry, with lessons in geometrical drawing, theoretical chemistry, and experimental physics. To students of the second year instruction was given in pure mathematics, general mechanics, mechanical drawing, practical physics, practical chemistry, biology, and mineralogy. To students of the third year instruction was given in mechanism and thermo-dynamics, applied mechanics and hydrodynamics, engineering, drawing, surveying, geology, palæontology, mining, metallurgy, applied chemistry, assaying and analytical chemistry; and there were special courses of instruction given in botany and practical botany, and in zoology and practical zoology.

The total number of individuals who attended the stated lectures was eighty, of whom twenty-nine were associates, students prosecuting the whole three years' course with a view of obtaining the diploma of associate. The corresponding numbers in the preceding year were fifty-nine and twenty-one respectively.

While England and Ireland have such institutions under the Science and Art Department of the Committee of Council on Education, Scotland has none. But it has under that department of the Government exceptional facilities for the organization of a School of Forestry on the lines I have suggested. In the Museum of Science and Art, which is under their direction, there is a valuable collection of forest products, enriched by a contribution of well-nigh 3000 articles obtained from the Forestry Exhibition, and likely to be also enriched with those placed at the disposal of the committee appointed by the Conference held at the close of that Exhibition, making it probably the most comprehensive and extensive collection of such articles in Britain, if not in Europe or in the world; and in the same Museum are well-selected illustrations of entomology and other departments of zoology, of mineralogy and geology, etc. Adjacent to the Museum is the Watt Institute, receiving grants from the Department reported in 1885, amounting to £179, where it may be assumed accommodation for classes might be obtained, and where, as in the University contiguous to the Museum, accessory studies might be pursued.

On the Normal School of Science and Royal School of Mines in London there were expended in the financial year terminating on 31st March 1885, £14,313, 2s. 5d.; on the Royal College of Science, Dublin, £6804, 1s. 4d.; with £14,056, 15s. 10d. for the Dublin Museum of Science and Art. The expenditure on the Edinburgh Museum of Science and Art was £10,689, 2s. 11d., and such an arrangement as has been submitted for consideration above would require, even when fully developed, no such expenditure as these. The expenditure would be entailed largely by provision for the support of students prosecuting their studies. To this I attach no small importance, and it is this, in conjunction with the capability of expansion from a small beginning, which in my opinion makes such an arrangement compare favourably with that of a Professorship of Forestry in the University.

The arrangements for the support of students is similar, if not identically the same, in London and in Dublin. I take for illustration the Royal School of Science in Dublin. This supplies as far as practicable a complete course of instruction in science applicable to the industrial arts, especially those which may be classed broadly under the heads of mining, engineering, and manufactures, and it is intended also to aid in the instruction of teachers for the local Schools of Science. Students may enter as associates or as non-associates. By "associate students" is meant all those who enter for the three years' "curriculum of the college" in any department. There are nine "royal exhibitions" of the value of £50 per annum, entitling the holder to free admission to all the lectures and to the laboratories; these are tenable for three years. And there are four "royal scholarships" of the value of £50 yearly each. And there are thirty-six "national scholarships." These are of the value of 30s. a week during the session of about nine months for three years, and they are tenable at the option of the holders at either the Royal College of Science, Dublin, or the Royal School of Mines, London. They also entitle the holders to free admission to all the lectures and all the laboratories.

Of the Royal Exhibitions, three are open for competition annually. Of the Royal Scholarships, two are offered for competition each year to students, not being royal exhibitioners, on the completion of their first academic year. Of the National Scholarships, twelve are open for competition annually to persons who have taken a first or second certificate in the advanced stage in any subject of science in the examinations of the Science and Art Department, and who show that they are *bona fide* Science Teachers. Holders of these may attend all the day lectures gratuitously, provided that they be examined in at least one subject, and that they pay a fee of £1 for each course in which they propose to be examined.

The fees charged to associate students for lectures and laboratories average £15 a year. Students wishing to make one payment for the whole three years' "course of lectures" are allowed to compound for £25 in addition to the laboratory fees. The fees payable by non-associate students are £2 for each separate course of lectures, with charges for laboratory instruction, graduated in each class according to the time attended. A non-associate student taking a complete course of instruction is admitted at the same fees as are charged to associate students; and in any case such receive certificates after examination, if they have attended two-thirds of an entire course of lectures. By these arrangements provision is made for enabling students of limited means to meet the expense of board and education without loss of self-respect. They are similar to those carried out in London; and if such were made in connection with a School of Forestry in Edinburgh, they would bring the course of study prescribed, in whole or in part as the student might wish, within reach of a great number of intelligent young men, who could not meet the expense of University life and University fees, with the advantage superadded that the holder of the exhibition or scholarship would have the satisfaction of knowing, and of having it known by his fellow-students, that this he has secured by giving evidence of his qualification for engaging in the studies to which he aspires,—which may be more than they could have done. And at the same time, a certificate of his having obtained such exhibition or scholarship, with certificate of his having passed satisfactorily both the entrance and the exit examinations of such a Government institution, might have assigned to it a definite value in any application the holder might make for any appointment at home or abroad.

CHAPTERS ON PROPAGATING.

BY A NURSERYMAN.

IT will be generally conceded that the art of propagating is not so well understood—or perhaps it may be more correct to say—not so fully and generally practised by foresters as by gardeners and nurserymen. The requirements of the forester for a full knowledge of the various modes of budding, grafting, and cutting making are necessarily more limited than those of the gardener, who has to do with a greatly larger variety of subjects in the prosecution of his craft, or of the nurseryman, who caters for them both in the pursuit of his business. But it will be conceded also that foresters should have a good sound knowledge of the art of propagating all the kinds of trees and shrubs with which they have to deal. The more they happen to know practically and theoretically, the more efficient practitioners will they be. And the practice of propagating is of itself such a fascinating one that it absorbs the attention of every one that engages in it, and gives a zest to his calling that can only, I suppose, come of a sense of deeper insight and sympathy in nature's works and laws.

It is to the younger readers of *Forestry* that I propose to address myself, believing that most, if not all, of the older readers know as much as I shall venture to teach, for I intend to confine myself closely to the discussion of those modes of the art that are essential to foresters in their practice with the comparatively limited number of species and varieties of trees and shrubs that ordinarily they have to deal with. Further, I may as well state here that I shall deal more closely with the principles that regulate the practice of the art than with the practice itself in detail, and without further preamble I shall pass on to consider *Propagation by Layering.* This is one of the most ancient modes of increasing plants, and it is not difficult to imagine how it was first discovered. We have it suggested to us in any ramble through tangled shrubberies and neglected woods where the undergrowth becomes matted with root-growth. The branches lying prone on the earth become, we observe, first abraded on the surface next the ground, and by and by are covered over with accumulations of leaves which wind and rain tend to increase and bind in their place to rot and form mould, and thus foster the emission of roots. The savage who roams in the primæval forests has better opportunities than we have to observe this suggestion of one of nature's methods for the special purpose of increasing the clothing of the earth. And the utilization of it would come with the necessities that spring out of the increasing wants that are the outcome of civilisation.

Layering may be described as perhaps the most primitive mode of artificially increasing the stock of any shrub or tree, and was probably for long the only way known of perpetuating such desirable varieties as did not come true from seeds. It is simply the art of rooting a branch while it is yet attached to the parent stock. The introduction of other methods has greatly curtailed its use even in nurseries in recent years. Budding and grafting when suitable stocks can be found are preferred to the slower and more laborious practice of layering. Experience also has shown that many of the subjects formerly believed capable of being increased only by layering may now be propagated by cuttings freely enough for all purposes. These circumstances, combined with a not very well authenticated but commonly entertained opinion that trees and shrubs, especially the former, propagated by layering are shorter-lived than those obtained by any other method, have tended much to lessen the practice. Still there are a good many species and varieties of trees and shrubs that are and must continue to be propagated by layers till our knowledge and possession of suitable stocks to work them upon by either budding or grafting or in-arching is more extended, for they are not amenable to the more easy way of increase by cuttings.

The season for layering is usually regulated in nurseries by convenience, and the most convenient time is either autumn or winter. The *stools,* as they are called, in other words the parent plants, must be cleared of the previous crop of layers, which may be planted out, and for the time be done with before a fresh crop can well be provided for, and this is most conveniently done in autumn or winter. This system answers well even though it is theoretically somewhat opposed to the physiological principles on which success is believed to rest. The theory is, that complete success in layering depends on a check being given to the descending sap at a point on the branch that is brought in contact with the ground. Hence it follows that the check should be administered at a time when the descent of the sap is most abundant, which would probably in most cases be about midsummer. But experience has taught us that this work may be done any time in autumn or winter, the earlier, however, the better, with unvarying success, and that it is never well to leave it over till spring, which is not only the worst time for the work, but is usually overburdened with other operations which can only be well performed at that season. But the chief reason for doing the work in autumn and winter is, as has already been observed, that the previous crop can be cleared away, which is a necessary preliminary to laying down another. This then should be done in autumn as early as it can be done with safety. Evergreens may be dealt with first, because they can be lifted and transplanted as soon as the ultimate or last-formed leaves are full grown and the points of the shoots of the season are tolerably firm. Deciduous subjects, on the other hand, cannot be dealt with till there is a pretty close approach to the end of the autumn, but the fall of the last leaf should not be waited for, the wood must be firm; but it will be an advantage rather than otherwise if there are a fair number of the leaves attached when the layers are transferred to their own bottoms in permanent quarters. The work of layering should then be set about forthwith as if time were precious, which it is assuredly. Now for the mode or modes, for they are several.

But first let it be understood that where there is much call for the practice of layering on the part of a forester, there should be a well-ordered stool ground established, containing well-selected specimens of the various subjects to be operated upon. These should be planted at such distances apart as will ensure ample convenience for the necessary work, including barrow-work, and also for the spread of the branches without the risk of their being injured while in growth or disturbed after they are layered. If the requirements are small and there are parent plants of the kinds wanted in the woodlands or grounds, there will be no need for a stool ground of the kind indicated, as the layering may take place where the parent stands, if it is in a practically favourable position for the operation.

The principal consideration in layering any plant is how best to check the descending sap at a point of the layer placed in contact with and covered with soil. Experience has shown that this object is best attained by making an incision on the under-side of the branch in an oblique direction upwards an inch or more in length, according to the dimensions of the branch, and penetrating to half the thickness of the same. This is the most common method, and when it can be practised is the best. But there are brittle and pithy subjects that will not submit to this treatment; they snap asunder as soon as it is attempted to bring them in contact with the earth, and elevate the point of the shoot as much as is necessary towards the perpendicular. In such cases barking and scarifying the bark hard into the alburnum or young wood; ringing the bark, that is, removing it all round or only on the under-side to the width of an eighth or a quarter of an inch; piercing, that is, forcing a small knife or an awl through the branch horizontally, and wiring or twisting a piece of wire round the branch at the point to be layered, and then scarifying the bark on the under-side, may be tried to overcome the difficulty. The point of the branch operated upon must then be brought in contact with the earth, and held there with a peg or pegs according to the strength of the branch, but there should be no risk of its drawing the pegs, and setting itself free after it is placed in position. If the check is effected by incision as first described, be careful in pegging the branch down to keep the tongue or heel formed on the under-side from returning to its position and closing with the upper half again, otherwise there may be a failure in the operation. When the pegging is satisfactorily done, the point of the layer may be brought as near perpendicular as possible, and the base covered with three or four inches of sharp sandy soil. It is perhaps necessary to add that if the natural soil is heavy and wet, it should be rendered light and dry before the operation of layering is attempted, and that the soil in which the layers are placed should also be deeply stirred.

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*BOXWOOD AND ITS SUBSTITUTES.**

BY JOHN R. JACKSON, A.L.S.,

CURATOR OF THE MUSEUM, ROYAL GARDENS, KEW.

THE importance of the discovery of a hard, compact, and even-grained wood, having all the characteristics of boxwood, and for which it would form an efficient substitute, cannot be over-estimated, and if such a discovery should be one of the results of the present Forestry Exhibition, one of its aims will have been fulfilled. For several years past the gradual diminution in the supplies of boxwood, and the deterioration in its quality, have occupied the attention of hardwood merchants, of engravers, and of scientific men. Of merchants, because of the difficulties in obtaining supplies to meet the ever-increasing demand; of engravers, because of the higher prices asked for the wood, and the difficulty of securing wood of good size and firm texture, so that the artistic excellence of the engraving might be maintained; and of the man of science, who was specially interested in the preservation of the indigenous boxwood forests, and in the utilization of other woods, natives, it might be, of far distant countries, whose adaptation would open up not only a new source of revenue, but would also be the means of relieving the strain upon existing boxwood forests.

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* This essay was awarded a silver medal at the International Forestry Exhibition, Edinburgh, and is reprinted from the *Journal of the Society of Arts.*

While by far the most important use of boxwood is for engraving purposes, it must be borne in mind that the wood is applied to numerous other uses, such as weaving shuttles, for mathematical instruments, turnery purposes, carving, and for various ornamental articles, as well as for inlaying in cabinet-work. The question, therefore, of finding suitable substitutes for boxwood divides itself into two branches, first, for engraving purposes, and, secondly, to supply its place for the other uses to which it is now put. This, to a certain extent, might set free some of the boxwood so used, and leave it available for the higher purposes of art. At the same time, it must not be forgotten that much of the wood used for general purposes is unsuited for engraving, and can only therefore be used by the turner or cabinetmaker. Nevertheless, the application of woods other than box for purposes for which that wood is now used would lessen the demand for box, and thus might have an effect in lowering its price.

In 1875 a real uneasiness began to be felt as to the future supplies of box. In the *Gardeners' Chronicle* for September 25th of that year, p. 398, it is said that the boxwood forests of Mingrelia, in the Caucasian range, were almost exhausted. Old forests, long abandoned, were even then explored in search of trees that might have escaped the notice of former proprietors, and wood that was rejected by them was, in 1875, eagerly purchased, at high prices, for England. The export of wood was at that time prohibited from Abhasia, and all the Government forests in the Caucasus. A report, dated at about the same period, from Trebizonde, points out that the Porte had prohibited also the cutting of boxwood in the Crown forests (*Gard. Chron.*, Aug. 19, 1876, p. 239). Later on, the British Consul at Tiflis says: "*Bona fide* Caucasian boxwood may be said to be commercially non-existent, almost every marketable tree having been exported" (*Gard. Chron.*, Dec. 6, 1879, p. 726).

The characters of boxwood are so marked and so distinct from those of most other woods, that some extracts from a report of Messrs. J. Gardner & Sons, of London and Liverpool, addressed to the Inspector-General of Forests in India, will not be without value; indeed, its more general circulation than its reprint in Mr. Gamble's *Manual of Indian Timbers*, will, it is hoped, be the means of directing attention to this very important matter, and by pointing out the characters that make boxwood so valuable, may be the means of directing observation to the detection of similar characters in other woods. Messrs. Gardner say:—

"The most suitable texture of wood will be found growing upon the sides of mountains. If grown in the plains the growth is usually too quick, and consequently the grain is too coarse, the wood of best texture being of slow growth, and very fine in the grain.

"It should be cut down in the winter, and, if possible, stored at once in airy wooden sheds well protected from sun and rain, and not to have too much air through the sides of the sheds, more especially for the wood under four inches diameter.

"The boxwood, also, must not be piled upon the ground, but be well skidded under, so as to be kept quite free from the effects of any damp from the soil.

"After the trees are cut down, the longer they are exposed the more danger is there afterwards of the wood splitting more than is absolutely necessary during the necessary seasoning before shipment to this country.

"If shipped green, there is great danger of the wood sweating and becoming mildewed during transit, which causes the wood afterwards to dry light and of a defective colour, and in fact rendering it of little value for commercial purposes.

"There is no occasion to strip the bark off or to put cow-dung or anything else upon the ends of the pieces to prevent their splitting.

"Boxwood is the nearest approach to ivory of any wood known, and will therefore probably gradually increase in value, as it, as well as ivory, becomes scarcer. It is now used very considerably in manufacturing concerns, but on account of its gradual advance in price during the past few years cheaper woods are in some instances being substituted.

"Small wood under four inches is used principally by flax spinners for rollers, and by turners for various purposes, rollers for rink skates, etc. etc., and if free from splits, is of equal value with the larger wood. It is imported here as small as $1\frac{1}{2}$ inches in diameter, but the most useful sizes are from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches, and would therefore, we suppose, be from 15 to 30 or 40 years in growing, whilst larger wood would require 50 years and upwards at least, perhaps we ought to say 100 years and upwards. It is used principally for shuttles, for weaving silk, linen, and cotton, and also for rule-making and wood engraving. *Punch*, *Illustrated London News*, *Graphic*, and all the first-class pictorial papers, use large quantities of boxwood."

In 1880, Messrs. Churchill and Sim reported favourably on some consignments of Indian boxwood, concluding with the remark, that if the wood could be regularly placed on the market at a moderate figure, there was no reason why a trade should not be developed in it. Notwithstanding these prospects, which seemed promising in 1877 and 1880, little or nothing has been actually done up to the present time in bringing Indian boxwood into general use, in consequence, as Mr. Gamble shows, of the cost of transit through India; the necessity, therefore, of the discovery of some wood akin to box is even more important now than ever.

BOXWOOD SUBSTITUTES.

First amongst the substitutes that have been proposed to replace boxwood may be mentioned an invention of Mr. Edward Badoureau, referred to in the *Gard. Chron.*, March 23, 1878, p. 374, under the title of artificial boxwood. It is stated to consist of some soft wood, which has been subject to heavy pressure. It is stated that some English engravers have given their opinion on this prepared wood as follows:—It has not the power of resistance of boxwood, so that it would be impossible to make use of it, except in the shape of an electro obtained from it, as it is too soft to sustain the pressure of a machine, and would be easily worn out. In reply to these opinions, Mr. Badoureau wrote:— "My wood resists the wear and tear of the press as well as boxwood, and I can show engravings of English and French artists which have been obtained direct from the wood, and are as perfect as they are possible to be; several of them have been drawn by Mr. Gustave Doré."

Mr. Badoureau further says, "that whilst as an engraver he has so high an opinion of the qualities of compressed wood as a substitute for boxwood, as the inventor of the new process, he considered that it possesses numerous advantages both for artistic and industrial purposes." In short, he says, "my wood is to other wood what steel is to iron."

The following woods have, from time to time, been proposed or experimented upon as substitutes for boxwood, for engraving purposes. They are arranged according to the natural orders to which they belong:—

Natural Order Pittosporeæ.

1. *Pittosporum undulatum*, Vent.—A tree growing in favourable situations to a height of 40 or even 60 feet, native of New South Wales and Victoria. It furnishes a light, even-grained wood, which attracted some attention at the International Exhibition in 1862; blocks were prepared from it, and submitted to Prof. De la Motte, of King's College, who reported as follows:—"I consider this wood well adapted to certain kinds of wood engraving. It is not equal

to Turkey box, but it is superior to that generally used for posters, and I have no doubt that it would answer for the rollers of mangles and wringing machines." Mr. W. G. Smith, in a report in the *Gard. Chron.*, July 26, 1873, p. 1017, on some foreign woods which I submitted to him for trial, says that the wood of *Pittosporum undulatum* is suitable only for bold outlines; compared with box, it is soft and tough, and requires more force to cut than box. The toughness of the wood causes the tools to drag back, so that great care is required in cutting to prevent the lines clipping. The average diameter of the wood is from 18 to 30 inches.

2. *Pittosporum bicolor*, Hook.—A closely allied species, sometimes 40 feet high, native of New South Wales and Tasmania. This wood is stated to be decidedly superior to the last-named.

3. *Bursaria spinosa*, Cav.—A tree about 40 feet high, native of North, South, and West Australia, Queensland, New South Wales, Victoria, and Tasmania, in which island it is known as boxwood. It has been reported upon as being equal to common or inferior box, and with further trials might be found suitable for common subjects; it has the disadvantage, however, of blunting the edges and points of the tools.

Natural Order Meliaceæ.

4. *Swietenia mahagoni*, L. (Mahogany).—A large timber tree of Honduras, Cuba, Central America, and Mexico. It is one of the most valuable of furniture woods, but for engraving purposes it is but of little value, nevertheless it has been used for large coarse subjects. Spanish mahogany is the kind which has been so used.

Natural Order Ilicineæ.

5. *Ilex Opaca*, L. (North American Holly).—It is a widely diffused tree, the wood of which is said to closely resemble English holly, being white in colour, and hard, with a fine grain, so that it is used for a great number of purposes by turners, engineers, cabinetmakers, and philosophical instrument makers. For engraving purposes it is not equal to the dogwood of America (*Cornus florida*); it yields, however, more readily to the graver's tools.

Natural Order Celastrineæ.

6. *Elæodendron australe*, Vent.—A tree 20 to 25 feet high, native of Queensland and New South Wales. The wood is used in the colony for turning and cabinet-work, and Mr. W. G. Smith reports that for engraving purposes it seems suitable only for rough work, as diagrams, posters, etc.

7. *Euonymus Sieboldianus*, Blume.—A Chinese tree, where the wood, which is known as Pai'cha, is used for carving and engraving. Attention was first drawn to this wood by Mr. Jean Von Volxem, in the *Gard. Chron.*, April 20, 1878. In the Kew report for 1878, p. 41, the following extract of a letter from Mr. W. M. Cooper, Her Majesty's Consul at Ningpo, is given:—"The wood in universal use for book blocks, wood engravings, seals, etc., is that of the pear tree, of which large quantities are grown in Shangtung, and Shan-se especially. Pai'cha is sometimes used as an indifferent substitute. Pai'cha is a very fine white wood, of fine fibre, without apparent grains, and cuts easily; is well suited for carved frames, cabinets, caskets, etc., for which large quantities are manufactured here for export. The tree itself resembles somewhat the *Stillingia*, but has a rougher bark, larger and thinner leaves, which are serrated at the edge, more delicate twigs, and is deciduous." In 1879, a block of this wood was received at Kew from Mr. Cooper, a specimen of which was submitted to Mr. Robson J. Scott, of Whitefriars Street, to whom I am much indebted for reports on various occasions, and upon this wood Mr. Scott reported as follows:—"The most striking quality I have observed in this wood is its capacity for retaining water, and the facility with which it surrenders it. This section [one prepared and sent to the Kew Museum], which represents one-tenth of the original piece, weighed 3 lbs. 4½ ounces. At the end of 21 days it had lost 1 lb. 6¾ ounces in an unheated chamber. At the end of another 14 days, in a much elevated temperature, it only lost ¼ ounce. In its present state of reduced bulk its weight is 1 lb. 10 ounces. It is not at all likely to supersede box, but it may be fit for coarser work than that for which box is necessary." Later on, in the Kew report for 1880, p. 51, Mr. R. D. Keene, an engraver, to whom Mr. Scott submitted specimens of the wood for trial, writes: "I like the wood very much, and prefer it to box in some instances; it is freer to work, and consequently quicker, and its being uniform in colour and quality is a great advantage; we often have great difficulty in box in having to work from a hard piece into a soft. I think it a very useful wood, especially for solid bold work. I question if you could get so extreme a fine black line as on box, but am sure there would be a large demand for it at a moderate price." Referring to this letter, Mr. Scott remarks that the writer does not intend it to be understood that Pai'cha is qualified to supersede box, but for inferior subjects for which coarse brittle box is used. Mr. Scott further says that of the woods he has tried he prefers pear and hawthorn to Pai'cha.

(To be continued.)

DRACÆNA DRACO (THE DRAGON TREE).*

THIS is the most peculiar of the rich and varied vegetable productions of the Canary Islands. These islands, from their remarkable geographical position and the great altitude of the Peak of Teneriffe, present a much greater variety in their flora than any other equal area on the earth. Teneriffe itself illustrates in its flora the characteristics of nearly every zone of vegetation in the world, from that of the tropics to the high arctic regions. But the most curious and interesting of all the species in these islands is the subject of our illustration on the opposite page. It belongs to the great and varied family *Liliaceæ*, of which very few of the species assume arboreal character and proportions, being chiefly bulbous or fibrous-rooted herbaceous plants. The *Aloë dichotoma* of the Cape of Good Hope, and the grass tree (*Xanthorrhæa hastilis*) of Australia, are arborescent forms belonging to the same great natural order, but they are dwarfs as compared with the dragon tree. The tree has a grim, weird antediluvian appearance about it, suggestive of the idea that it is a survival of ages past, and that it may have witnessed the struggles for existence whose records are written in the strata of the earth. It was an object of Druidical veneration for centuries before Christianity appeared on earth, and the hollow trunks of some of the older trees were used by the early Christians as places of worship. One specimen, the largest then known, died recently. It stood in the garden of the Marquessa de Sansal at Orotava. It was of enormous dimensions, and its hollow stem was used by the Spaniards so far back as 1493 as a chapel in which to celebrate holy mass. The trunk was between 70 and 80 feet high and nearly 50 feet in circumference at the base, with very little taper, rising like a huge pillar, rudely scarred and surmounted by a crown of long sword-shaped leaves, tough, leathery, and dark-bluish olive-green. A red resinous juice exudes from the trunk, which on exposure to the air becomes concrete, and forms a kind of dragon's blood, whence the popular name of the tree. It is not, however, the true dragon's blood of commerce, which is the product of a Calamus (*C. draco*), a native of India and the Moluccas. The substance is collected and used for various purposes. Having formerly been credited with astringent qualities, it was used in medicine, but is now rarely employed except as a colouring for tinctures, the true dragon's blood being preferred for that purpose instead. It appears to have been employed by the ancient Guanches for preserving their dead. Our illustration is taken from the largest specimen now extant, which stands just outside the gates of the cemetery at the little steep village of Icco del Alto. The age of these monster trees must be very great, but there is no means of deciding how great even approximately.

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* We have pleasure in acknowledging our indebtedness to Mr. G. Harris Stone, 22 Buckingham Street, Strand, London, for permission to use the copy of his photograph of this famous tree.

THE MISTLETOE (VISCUM ALBUM).

THIS is the only true parasitical plant indigenous to Britain, because at no period of its existence does it obtain its nourishment directly from the soil. It germinates in the bark of the tree to which the seed by natural or artificial means becomes attached, and if it should perchance fall on the soil and germinate, there it immediately dies. It is not particular as to the sort of tree it lives upon, as it is found growing alike freely on the apple, thorn, maple, poplar, lime, ash, oak, and even on the pine, but less freely on the two last named than on any of the others. All the readers of *Forestry* and the public in general are familiar enough with the plant to render description of it here superfluous. The young folks of both sexes look for it in the Christmas decorations of every home with as much zest as for plum-pudding and mince pie. It is an indispensable emblem of Christmas with most European nations, but especially with the Teutonic and Anglo-Saxon races; and our American cousins look upon it with quite as much favour in that light as we do ourselves. They do not grow it themselves; it is not indigenous to their country, rich though it be in kindred species, so they import it in immense quantities from this country and from Normandy annually, and, curiously enough, it is one of those things that is exempt from their protective tariff.

The mistletoe has been surrounded by mystic interest from time immemorial. The name, which is a compound of two Anglo-Saxon words—*mistal,* gloomy, dark, or mysterious; and *tan,* a twig—indicates that even our traditional ancestors regarded it with feelings of veneration akin to fear, and they certainly credited it with mystic attributes which we fail to appreciate; yet we cling to the plant and associate it with our great annual time of rejoicing. The ancient Druids appear to have venerated only that which was found growing on the oak. They associated it with their banquets and sacrifices, and gathered it for these purposes with great ceremony. Dressed in white and carrying a consecrated white mantle, the priests led two white bulls under the tree from which the mystic boughs were to be cut. Appropriate ceremonial chants were sung, and the priest, armed with a golden sickle, mounted the tree and cut the boughs, dropping them into the consecrated mantle which was spread below to receive them by his attendants.

Among the many legends that attach to this interesting plant, one retained among the Scandinavian tribes is remarkable. According to this legend, Hoder, the blind god, slew Baldur, the great sun-god, with an arrow which had been dipped in a subtle poison extracted from the mystic plant. It would appear from this that that which might prove fatal to the gods was almost a panacea for all the ills of mortals, for the plant was regarded in the light of a cure for all diseases.

The mistletoe is very easily established or propagated by means of its seeds or berries. Birds and other agents in nature do the work, unconsciously dropping the seeds promiscuously in favourable and unfavourable places, and the result is, as usual in such cases, a success in the aggregate. But any one may grow his own mistletoe who possesses a garden with a few apple trees growing therein. Procure the seeds or berries any time during the winter, and prevent them from becoming dry, and during the first mild weather make as many slits in the bark of the branches near their junction with the stem or with heavy limbs, and place a berry in each slit. Some, in order to protect the seeds from birds, tie a strip of matting or string over the berry; but this is hardly necessary, as they are rarely touched. A little clay, prepared as for grafting, spread over the berry and the entire slit, is an excellent preventive of drying during the germinating process of the seed.

Druid.

COUNT DE CARS' BOOK.

A DEFENCE OF A CRITICISM.

MAY I ask for space for a few remarks on Mr. James Farquharson's paper at p. 501? I agree with him that to preserve a tree for its ancestral value and its position in the landscape no device that will prevent decay ought to be despised.

This is not the main question under consideration.

Monsieur de Cars' work may become a text-book in a British School of Forestry. Though an amateur, I have delighted in plantation work for more than fifty years, have cut ten acres of old oak wood of my own, and have studied the growth of timber in various climates. If there be any truth in my remarks, I trust they will warn foresters against what I take to be erroneous directions contained in the manual of pruning under consideration.

The fallacy I wished to point out is as stated. The wound is never healed. The dead surface is only covered over with living wood.

Mr. Farquharson: "True, but only so when the branch is previously dead, and so dead that the cutting off of it level to the trunk does not reach the quickwood of the trunk."

Here I join issue, and contend that the cutting off of a living branch kills the surface of the wound left on the trunk. The sap ceases to flow through it, it therefore dies, except where the bark of the trunk surrounds it. I do not look upon all branches as being dead before they are cut from the tree. The act of cutting off a branch kills the surface left, and it is incorrect to speak of its healing over. Coal-tar may preserve the dead surface from decay; it cannot restore the circulation of sap, and give it life. No union takes place between the old dead and the new living wood which covers it.

I have watched the covering over of large wounds for many years, which were made in oak and ash trees when a road was altered in a gentleman's park, and saw the death of a very fine ash tree caused by a wound less than 20 inches across, carefully planed off and kept painted, and cemented after decay began in spite of paint. The wound was about 5 feet from the ground. Decay went down into the root, and killed the tree about thirty years after the branch was cut off.

The surface of large wounds on beech always decay before the wound is "healed," so far as I have observed.

I quite agree with my critic that the "principle cannot be established," that large wounds can be made without injury to the tree.

He passes over my difference with the author, p. 576.

I adhere to what I said at p. 395 of your number for October last.

No architect would pass a piece of oak which had complete severance of its tissues, even where the surface has been preserved from decay by one or more coats of coal-tar. A wound 20 inches wide would take more than twenty years to be covered over with new wood, and thus would require more than one coat of tar to preserve it.

"The diagram clearly shows that cutting a branch off in a line with the trunk, carries the defect in the timber well into the heart of the tree."

The defect consists in the timber having one part of it severed from another, for the whole size of the branch which has been pruned off.

Suppose a piece of oak timber from a tree that had a large branch cut off was wanted for church work, furniture, or any purpose, would an architect pass it with its substance severed one part from the other? for the dead surface never joins with the living wood which covers it.

The same remark applies to the next paragraph quoted by my critic.

He afterwards says, "No sane person, possessed of even the crudest notions of pruning, would ever think of removing two such branches at once."

How very insane the writer of the work in question must be, for he says, p. 649, it became necessary to make seven wounds from 10 to 20 inches wide on an oak tree 200 years old, and there is nothing to show they were not all made at the same time. The diagram at p. 406 must be a very extreme case if not an imaginary one. I saw none such in the ten acres of oak wood I cut down.

An article in your December number, "Close Woods or Open," shows, p. 485, that "of the £20,000,000 worth of timber which is yearly imported into the United Kingdom, by far the greater part has been produced in natural forest. The excellent timber reaching us from Scandinavia, Russia, and Canada has seldom known the fostering care of any forester."

Pruning is an expensive process, and as we get our finest timber, freest from knots, from unpruned forests, may not more natural and injurious effects be produced by keeping woods close?

Nursing even in hospitals may be overdone, giving the patient no rest and not leaving enough to nature. The same thing with regard to plantations is one of the causes why they do not pay as well as they might be made to.

In conclusion, I contend again that if the branch is living instead of dead when cut off, the application of tar to the wound, though it may preserve the wood from decay until the process of covering over is complete, no healing takes place, and the timber so treated must be defective. Mr. Farquharson does not distinguish between death and decay. HENRY ROGERS.

HARTLEY, PLYMOUTH, 21*st January* 1886.

FOREST RENOVATION AT MOUNT MACEDON.

FROM "THE MELBOURNE LEADER."

THE planting of forest trees, initiated on Mount Macedon by Mr. William Ferguson about a dozen years ago is proving highly successful; the only cause for regret is that the various Governments have not been more liberal towards such a beneficial national object as the provision of a continuous supply of timber. The varieties of climate in Victoria are so diverse that we might provide ourselves with the timber trees of nearly all parts of the world, from the arctic zone nearly to the tropics. The native timber is being rapidly reduced, the demand for it yearly increasing, and little has hitherto been done towards the recuperation of the forests, either by replanting or by tending the young saplings, which spring in abundance wherever the full-grown trees have been cleared away. Had this important branch of forestry been attended to in time, the mountain might now be reclothed with indigenous timber fit for commercial demands. The experiment of cultivating exotic timber has, however, had a fair trial, and clearly shows what may be done in that way. When such favourable results have been attained, and that at a cheap rate, it seems a pity that the experiment was not carried further; for by the addition of a very few hundreds a year, the nursery for propagating and even the trees having been ready, Mr. Ferguson would have had the whole surface of the mount covered by this time, whereas less than 200 acres has been planted on Mount Macedon, in addition to about 40 acres sown on Station Peak. Thirty-five acres were planted on Macedon last year, and 100 acres have been cleared and fenced; of this area 10 acres have been sown with seeds of various kinds, in the same manner as at Station Peak.

Since 1881, the date of our previous visit, the earliest planted trees have made astonishing progress. As might have been surmised, *Pinus insignis* has made the largest growth, the trees planted in

1874 being now 30 to 40 feet in height. Where closely planted, the lower branches are dying off, leaving clean boles, from many of which 6-inch to 8-inch boards might be cut, so that they will very soon become of considerable commercial value, which Mr. Ferguson means to at once ascertain by sending a tree to the sawmill to be cut up, whereby the quality of the timber may be also tested. The trees on each side of the drives, where the interspaces are greater, have formed branches of a strength corresponding with the height, and it is now a difficult work to ride through amongst them, for both man and horse. Other species of pine have succeeded proportionately well; among these *Pallasiana* is very distinct, and one of the most thriving. It is a native of the central regions of the Crimea, to which region it is confined, and where it forms forests of considerable size on the declivities of the mountains. The wood is very durable. *P. ponderosa*, the black or pitch pine or trucker pine of the mountains of north-west America, the yellow pine of the Pacific coast, is placed at the head of American timber trees, and is allowed to be the grandest of all. It attains a height of 225 feet, with a stem of 24 feet in circumference. The wood is yellowish, hard, strong, durable, and heavy, and for general purposes preferred to that of any other pine; so that Mr. Ferguson does well to raise all the seed of it he can obtain. The trees of this species on the mountain are not nearly so tall as those of *P. insignis*, but are the most robust of all pines. *P. rigida* grows pretty well; it is the American pitch pine, and important for its yield of turpentine, resin, pitch, and tar; unfortunately it is a favourite of the opossums, which make their way into the reserves and have destroyed several trees by gnawing the bark. *P. strobus* thrives well; it is the Weymouth pine or American white pine, attaining a height of 270 feet, with a stem of 8 feet diameter when in good soil. Its timber is light, easy to work, and very durable. It is the principal lumber pine of the Eastern States, and is one of the most ornamental of the genus. *P. excelsa*, the Bootan pine, bears external resemblance to the former, and also thrives well in the climate of Macedon; it grows to a tall tree, furnishing a valuable close-grained, resinous, soft, and easily wrought wood, ranking next to the deodar. The pinaster and Scotch pine are also thriving. There are besides specimens of *Monticola*, *Contorta*, and others in smaller numbers. In the *Abies* section *Douglasii* bears the palm for rapidity of growth, and will probably prove one of the best of conifers for mountain planting. *Smithiana* and *Webbiana* are thriving. The larch does well, forming tall, handsome trees in a few years. The common spruce is also promising to form a good timber tree for mountainous districts. The deodars are not so fine upon the whole as might be wished, though they are expected to improve with age; some of them are well-grown, healthy trees, but others have a sickly appearance. *Cupressus Lawsoniana* has done well, and it is becoming a tree instead of a bush as generally seen. It is one of the best of Californian timber trees, attaining a height of 100 feet, with a stem 2 feet in diameter, and furnishes a valuable timber for building purposes, being easily worked and very durable. The heavy snows of last winter effected some injury to the pines, a branch here and there and even a top of a tree being broken. The ferns, with which the ground was covered, are destroyed, but there is abundance of grass, and Mr. Ferguson recommends that sheep should be taken in to graze and keep it down, as they cannot now injure the trees.

In the younger plantations deciduous trees have been intermixed with pines, including oak, ash, sycamore, the Canadian elm, and others. One plot of 50 acres has been planted with oaks, among which a few pines are interspersed merely to relieve the monotonous appearance of the deciduous trees when denuded of foliage. In the ground recently cleared 10 acres have been sown with pine and other seeds, which will probably be found the best and most economical mode of reafforesting. Holes 2 feet across are dug 15 inches in depth and 15 feet apart, in the end of winter, and the seed is sown in November, experience having taught Mr. Ferguson that they succeed best at this season, when the soil has been warmed by the sun. Of course the seed can be sown much earlier on Station Peak, where the season is earlier. Two men are kept at work on the mountain, but more labour is required, now that the trees are attaining a size that renders pruning, thinning, etc., necessary.

Another striking and satisfactory proof of the practicability of reafforesting is to be found in the Nursery Reserve at Lower Macedon, where the soil is poor and rocky. After clearing the gum trees it was planted with *Pinus insignis,* which have grown still more rapidly than those on the mountain, probably because of the more sheltered situation; they already average 30 to 50 feet in height, some of them being 60 feet, and only eight years old from the seed. The plantation attracted the attention of the Governor on a recent visit, and excited warm admiration. The trees have now clean boles, some of which are several feet long, and with a dense canopy of branches overhead. The extent of this plantation is 17 acres; nothing has been done to the soil besides digging holes for the trees.

The Nursery is, as usual, in admirable condition, fully equal to the best forest tree nurseries in any part of England or Scotland. Hardly a weed is to be seen. The various plots are either filled with young stuff, or, in a few instances, lying fallow, which is found to be necessary in the poor soil after a few years of tree-growing, when the opportunity is taken of applying manure, and generally a crop of potatoes is taken off, thus bringing the land into suitable condition for another crop of trees. The manure used is a mixture of tree leaves and stable dung, some of it being used in the first place for hotbeds. In addition to the young trees in the ground, a large number of the more select or delicate sorts are in pots, for which purpose a number of frames with shades are used, besides several with glazed sashes. One of the latter is filled with fine plants of *Cinchona Ledgeriana,* the hardiest and best of the Peruvian barks. A large number of American grape vines have been raised, the species consisting of *Vitus indivisa, æstivalis, cinerea, cordifolia,* and *rupestris.* There are plantations of Cork oak and the Valonia oak, so valuable for tanning and dyeing; also of the tea plant, but these are not making much progress, probably requiring more moisture in the soil. There are 600 plants of the *Catalpa speciosa.* a species superior to *C. bignonioides,* the wood of which is almost indestructible.

Amongst the single specimens of ornamental trees, some of the most striking and handsome are:—*Abies firma* (Japan), thriving, 7 feet tall; *A. Nordmanniana,* one of the best; *A. Douglasii; A. Menziesii,* which grows rapidly, has attained a height of 40 feet—it is a grand tree; *A. Albertiana* and *A. canadensis*—the hemlock spruces of California and Canada—are exceedingly graceful trees; *A. Fraseri* and *A. balsamea* are very pretty; *A. Webbiana* is beautiful; *A. Smithiana—Pinus Khutrow,* Royle—is a very handsome tree; *Pinus Fremontiana* is a distinct species of rather loose habit; *P. palustris* is quite unique—the specimen is believed to be the only one of its kind in the colony, and it is remarkable for its long leaves; *P. tuberculata, P. insignis,* and others are now coning and producing seed which is being utilized. Of the larch there are some beautiful and vigorous specimens. *Wellingtonias* do exceedingly well, as also their relatives the *Sequoias. Araucaria brasiliensis* and *A. imbricata* like the climate, one specimen of the latter having attained a height of 15 feet. *Thuja Lobbi* is forming a noble tree. Spanish chestnuts, horse chestnuts, and the different species of *Cratægus* are well adapted to the climate. The native beech, *Fagus Cunninghamii,* forms a graceful tree, very beautiful at this season, the young leaves being tinted crimson. The rare *Eucalyptus alpina* is making good growth and seems at home. The list of oaks is long, and includes all the fine coloured-leaved species; *Quercus Skinneri* is very free and graceful. The Canadian elm is one of the best growers and most handsome. *Acers* also succeed, including the common sycamore and its variegated varieties. The planes are quite at home, and are forming fine avenues. Among shrubs the rhododendrons are very fine. An ivy planted against a stump has grown up and assumed the tree form; it is a handsome object. *Eucryphia Moorei* is a very handsome flowering shrub that ought to be more cultivated. *Telopea speciosissimus*—the Waratah of New South Wales—grows extremely vigorous; it is producing large and fine flowers. *Ericas* do exceedingly well, especially the British species.

SHOULD CONIFEROUS TREES BE PRUNED?

TO the question as to whether coniferæ should be pruned, I answer yes, if they require it and it is well done. Certain species, particularly those of the fir, larch, and pine tribes, when grown in masses together in the way in which they grow in nature, require little or no pruning beyond what nature does for herself in the circumstances. The natural habit of such trees is to produce a balance between stem and branch, which is, apart from accident, perfect. It is rare, except when by accident the leading shoot of the stem becomes broken, that the balance of symmetry is disturbed. In such a case pruning is necessary to rectify the disorder, and unless it is attended to in time the value of the timber will be affected adversely in the majority of instances, and probably the lives of the trees endangered. For it is when young only that resinous trees, which all coniferæ are more or less, should be pruned. Large vigorous limbs may not be cut from them with the same impunity that they may be cut from non-resinous trees. Bleeding more or less is sure to follow any considerable amputation, and it often continues for years, causing death eventually. Any such risk is entirely avoided by pruning when the growth is fresh and young; and should any departure from the natural balance of individual trees have been allowed to continue for years, I should say that, instead of operating on limbs which have acquired considerable size and are healthy, it would be better to leave them alone. Coniferæ that are grown thickly together in their natural conditions should receive attention in their earlier years, to prevent any tendency in individuals to decline from the balance between branch and stem which is true to their habit of growth; and the first few years after planting is all the time that such attention will be required. The removal of dead branches from all trees is so manifestly desirable from all points of view, that one would think little should require to be said on the point. Yet there are those who object to doing so on the ground that it is totally unnecessary; that the finest timber imported from the natural forests of northern Europe and America had never been pruned in any way. They forget, however, that the circumstances that exist in our artificial plantations are totally different to those of the dense primeval forests whence our imported timbers come. The great density of growth and the larger degree of humidity that obtains in the natural forest, leading to more rapid decomposition of dead organisms and the constant play and movement of animal life, all tend to clear away the dead branches before they are absorbed to any injurious extent in the increasing growth of the stem. In any case the advantage of removing the dead branches from the stems of trees in our plantations is so self-evident that it is idle to dwell on the subject at length. When a limb has lost its functions it can be of no further use to the tree, therefore it should be removed. The health of the tree is certain to be impaired and the quality of the timber depreciated by leaving dead branches to become absorbed by every increasing ring of wood added to the girth of the stem.

When coniferous trees are planted at wide distances apart, as in pinetums, where they are to become perfect specimens of their kind, closer attention will be necessary in their management as regards pruning. Being more exposed, they are more liable to injury by wind and other causes. It is also desirable that their natural symmetry should be developed and preserved to the fullest perfection. This is the sole object of planting such collections; timber or utility is not considered in connection with the pinetum. But the pruning of coniferæ in this case is an operation requiring considerable knowledge of the habit of growth of the various species and varieties composing the collection. The loss of a leader at any time must be noted, and steps taken to repair it as early as possible. Generally speaking, when this occurs in individuals of the pine and fir tribes, it is caused by wind or even by a bird alighting on the leader when it is young and brittle. Two or more shoots may start in competition for the leading place, and the operator must choose which is the most promising. The others should be foreshortened, and that selected should be tied up in position so as to continue the straight line of the stem. Very frequently it may be found that the lateral branches may get out of balance by more luxuriant growth on one side the stem than another. This should be corrected by disbudding or pinching the points of the over-luxuriant shoots back before they gain any ascendency over the weaker ones. This is all the treatment wanted by the larger-growing species of the tribes alluded to, and they may need operating upon only occasionally, and many individuals may never need any correction at all.

But there is a large class of the choice ornamental coniferæ belonging to the genera *Cupressus*, *Thuja*, *Juniper*, and *Retinospora*, which are benefited by annual pruning. They have all a greater or less tendency to form a multiplicity of leading shoots, which generally in the long run leads to their becoming ill-balanced and irregular in shape, and made up of many weak stems that are liable to break away under pressure of wind, heavy rain, or snow. Without annual pruning, also, many are apt to become thin and bare below. The most important point in dealing with this class is to see first that only one leader is permitted, that is, in all which have an upright pyramid form. The lateral branches should then be foreshortened with the knife or the finger and thumb, so as to balance the plant in an even and symmetrical way in strict harmony with its natural habit, but on no account so as to suggest the idea of their having been gone over with the hedge shears. In all species having a tendency to develop their greatest luxuriance at the top or in their upper branches, the pruning should be directed so as to counteract that tendency, always foreshortening the most luxuriant branches. The principle applies equally to those species with squat or rounded forms. They will be improved by occasional shortening of the shoots in a general way all over, but especially with the view of preventing their getting bare and unfurnished below.

The best time to do such pruning is in spring, but it may be done any time during the season of growth without detriment.

A. X. E.

PASTURE IN RELATION TO FORESTS, WITH SPECIAL REFERENCE TO UPPER HUNGARY.

BY FORSTDIRECTOR BEAUREGARD.

Translated for *Forestry* from the *Centralblatt für das gesammte Forstwesen.*

IT is the task of every forest manager in the forests entrusted to him to strive to have the woods as regular and normal as possible, or at least to approach such a condition of things. It is his task to make the best use of the soil in his charge by the raising of fully timbered woods, and by close conservation and zealous cultivation to further and accomplish the reproduction of close young woods.

In such regularly stocked and normally treated forests there ought, strictly speaking, to be nothing at all to say about pasture. All ripe or nearly mature woods should have the ground underneath provided with a covering of fallen leaves or fir species, to the complete exclusion of grass. The same holds of woods in the middle period of their growth. As to the youngest woods, although until they have joined and interlaced their branches they are too richly provided with grass, yet what they require is protection and care, and not disturbance by pasturing cattle. Unfortunately in practice things are quite otherwise.

The Crown lands on the Austrian side of the river Leitha have enjoyed orderly forestal conditions most of them for over a century, and there, it may be granted, things are much better, forest pasture being almost a matter of the past, or, where it still exists, being relegated to heights above the timber line, or confined to pure pasture land which has ceased to be forest. Notwithstanding this it may be generally asserted of all provinces under the holy crown of St. Stephen, that even to-day almost the whole of their woods, the State forests scarcely excepted, are pastured, and that, moreover, a considerable part of them are quite overburdened with pasture.

I may be allowed, perhaps, to remark in the first place upon the cattle which are driven into the woods, before I proceed to describe more minutely the sad results of this injudicious mixture of forestry and pasture.

In nearly all woods, horses and oxen, the draught cattle of the forest labourers, are pastured singly. Cows, too, are driven in in herds, and numbers of swine, especially in moist years (when acorns and beech-nuts are plentiful), are pastured in the woods. But the sheep are everywhere by far the most numerous. Fortunately goats are by law altogether excluded from the forests.

Horses, oxen, and cows are endurable when not in excessive numbers. And so long as the young woods are unpastured, until they have grown higher than the cattle can reach, it is probable that these cattle must be occasionally admitted even into the most improved forests. The pasture of swine, too, is, with good reason, acknowledged to do more good than harm when proper places are chosen for it. In old oak woods, where the soil is often trodden quite fast like an earthen floor, the swine turn it up and loosen it, making it again sensitive for the seeding. They also in the process bury quantities of acorns and other seeds in the earth in a bed almost prepared for their germination. They consume, finally, endless quantities of vermin, such as cockchafers, maggots, caterpillars, mice, and the rest, and are thus useful to a considerable extent. But sheep, on the contrary, are for the woods an unmitigated plague. Sheep, moving in closely packed herds, do as much harm by treading the life out of tender young plants, as they do by nibbling, and they nibble nearly all kinds of wood, with perhaps the single exception of the elder. For instance, all the more lighted oak woods after a good acorn year carpet themselves with a close growth of young oak seedlings. But the first herd of sheep which is driven into such a wood in spring tramples this work of nature with all its rich possibilities, and destroys it completely.

NEWFOUNDLAND AS A TIMBER COUNTRY.

NEWFOUNDLAND from the sea does not look an inviting country. It has a bleak, cold, and barren appearance. This, however, may be said of other countries that are known to have fertile soils and temperate climates. The east face of the island is washed by the North Atlantic and the Arctic Stream. The west coast is on the Gulf of St. Lawrence, and on account of the influence of the Mexican Gulf Stream, and the humid warm winds which blow from it, the west coast is the most heavily timbered portion of the country, and the climate is the most temperate and equable. The north side faces Labrador, which is divided from Newfoundland by the Straits of Belle Isle, twelve miles wide, and open as a short cut between Liverpool and Quebec for about four months in the year. Newfoundland has an area of 36,000 square miles, exactly the size of Lake Superior, and one-sixth larger than Ireland, the two countries being warmed by the Mexican Gulf Stream, and both receiving cold currents from the north, and having foggy, humid climates, that are, however, through the large amount of sea ozone in the air, exceedingly healthy. Newfoundland is the oldest of all British colonies, and is now self-governed, the Legislature consisting of a Representative Chamber, with a Council and a Governor appointed from England, the three forming the constitutional authority. Railways on the island have not yet made much progress, but there is now a strong tendency to promote that class of enterprise, and thus before long open up one of the finest islands on the globe. It is said that more money was made by the fisheries of Newfoundland than from the silver mines of Potosi, which doubtless is true, because unquestionably those fisheries are the most prolific in the world; and here, again, the comparison between Ireland and Newfoundland is strong. To a large extent the fisheries are the cause of the backward state of the island, for up to a recent period the object of many of the leading men was to keep everything to themselves, and for this purpose, as far as possible, to prevent colonization and settlement. Strange as it may seem, the policy of most of the Governors, with the exception of the late Sir John Hawley Glover, was to discourage every enterprise but the fisheries. The result of this narrow policy was the locating of the population, which is still under two hundred thousand, on the bays and creeks with which the east and west coasts are deeply indented. How anxious those who enjoy privilege are to keep it, notwithstanding the wrong that may be done to others! For years it was thought that the North-West Territories of Canada were barren and uninhabitable, instead of being what they undoubtedly are, some of the most fertile land on the American continent. The Hudson Bay Company had a monopoly in the fur trade of those regions, and they were more or less anxious to keep it by allowing the idea to go forth that the country was unfit for colonization. The same with the French and English shipowners of Newfoundland, because they circulated and fed a report that the interior was a scrubby, swampy morass, and the rivers torpid and sluggish, flowing between barren and cheerless banks. This is not the case, as it is now beginning to be pretty well understood that there are at least two million acres of splendid white pine and other timbers on the watershed of the streams discharging on the west coast, all of which flow from lakes in the interior, and not from swamps or lagoons, as generally believed. This fact was first made known by an adventurous Scotchman named Carmack, who in 1829 crossed the island with an Indian half-breed as his only companion. Carmack, who would seem to have been a man of strong physique and mental powers, wrote a most glowing account of the hitherto unexplored interior—grassy plains, water lakes, and streams crowded with fish, wild fruit of almost every kind in abundance, and vast forests of white pine, spruce, birch, and tamarac, but no oak, beech, elm, or cedar, those timbers being as yet nowhere found on the island. The narrative set some men's teeth on edge, and an agitation was got up for further exploration; but the short-sighted policy already alluded to had a stultifying effect, and nothing of importance was done until 1871, when the Government of the island appointed a gentleman named Murray to make a geological survey, and almost in every particular he confirmed Carmack's story. He reported that the Exploits was a noble river flowing north-east, with large and valuable pine forests on its banks, and draining an immense area of fertile land. On the west coast there are several comparatively large rivers, such as the Terranovo, the Gander, the Gambo, and the Humber, all taking their rise in lakes, around the shores of which there are vast primæval forests that the saw or axe has not yet touched. They are unsurveyed and ungranted, but not likely to long remain so, as a line of railway is now laid out from Trinity

Bay on the Atlantic, or east coast of the island, to Cape Ray on the north-east coast. This line will be a trunk, and traverse the entire length of the island, with a branch to St. George on the north coast; and as it is only to be a link in rapid travel between Europe and America, it will bring in men who will soon develop the timber and other resources of Newfoundland. The distance from Liverpool to Trinity Bay is about 1800 miles, and then rail to Cape Ray, and from there a powerful ferry across the gulf to Cape Breton, and again rail from there to all parts of the American continent, and with this route in operation the timber of Newfoundland will soon be in the market. There is now a line working between Fortune Bay and St. John's, owned by a syndicate of American capitalists, to whom the concession was given by the Newfoundland Government; but it is only the first step in the railway development that is likely to take place in the near future, which will, in all probability, facilitate a Newfoundland lumber trade, because, up to the present, boating is the chief means of transit. To realize the want of progress in the country, let us imagine England only inhabited by 200,000 people, settled on the Cornish and Lancashire coasts, without railways or roads, and engaged entirely in catching and curing fish, and the only means of intercommunication being small steamers or fishing schooners, then one can understand the non-development of Newfoundland. Hitherto, Quebec has had the inner track of the timber trade, and as it was a question of demand and supply, the merchants of that city did everything in their power to meet the requirements of their customers. They had their agents in England, and the captains of the timber fleets were both trained and induced to go for cargo to Quebec, with the result that Newfoundland, which is nearer to England, was neglected. But now that the pine regions of Canada are yearly becoming more remote, most of it at present coming down the Ottawa from the lake country, and the divide between the waters flowing to the Atlantic and those going north to the Hudson's Bay, no doubt the pine, spruce, and birch forests on the shores of Red Indian Lake and Gander Lake in the interior of Newfoundland will receive attention. The countries round the Gulf of St. Lawrence, Nova Scotia, New Brunswick, Prince Edward's Island, even Maine and Massachusetts, have plenty of timber of their own, and consequently there was no local incentive to develop a Newfoundland lumber trade. It is true that there are a few sawmills running, chiefly on the west coast, two or three being in the Bay of Islands, at the mouth of the Humber. The principal use for those mills is making lumber for the fisheries, very little of it being exported, notwithstanding the excellent reputation of Newfoundland birch and white pine. One of the Allan Mail steamers runs weekly from Liverpool to St. John's, and as Newfoundland has many valuable resources besides timber, such as copper and other minerals, magnetic iron sand, and many millions of acres of virgin land, together with a healthy climate, it would physically, mentally, and perhaps financially, be a good thing for many a wearisome stay-at-home man to make a trip to England's oldest colony, situated at the junction of the Sutic and Gulf Streams, at the mouth of the mighty St. Lawrence, one of the largest and cleanest rivers on the surface of the globe.—From the *Canadian Gazette.*

SOCIETIES.

SCOTTISH HORTICULTURAL ASSOCIATION.

THIS Association held its tenth meeting of the session on the 5th ult., at 5 St. Andrew Square, Edinburgh—Mr. Milne, of Messrs. Dickson & Sons, in the chair. A paper on "Vine Borders —Inside *versus* Outside," contributed by Mr. William Priest, of Eglinton Castle, was read by Mr. Munro, the secretary. Mr. Priest gave it as his opinion that, for early forcing, vine borders should be entirely confined to the inside, whereas for intermediate and late-growing vines he prepared an outside border. He also gave a practical exposition of vine culture and the formation of borders generally. The paper was afterwards discussed, and a vote of thanks awarded to Mr. Priest. The exhibits on the table included a fine fruit of *Stephanotis floribunda,* sent by Mr. Mackinnon, Kylemore Gardens, county of Galway, which received a cultural certificate; a number of hardy flowers grown in the open air, and forwarded by Messrs. Dickson & Sons as showing the mildness of the present season; some specimens of dried plants gathered by Mr. Redmond, banker, Antrim, which were awarded a certificate of merit; and a large and well-conditioned spray of *Chrysanthemum elaine,* from Mr. Sinclair, East Linton. Votes of thanks to the Chairman and the exhibitors closed the proceedings.

EDINBURGH BOTANICAL SOCIETY.

THIS Society held a meeting at 5 St. Andrew Square on the evening of the 14th ult. The name of Richard Spruce, Ph.D., Coneythorpe, Yorkshire, was added to the list of six British Honorary Fellows.

The following papers were also read:—"The Inflorescence, Floral

Structure, and Pollination of *Scrophularia aquatica* and *S. nodosa*," by T. Wemyss Fulton, M.B. "On *Calamagrostis strigosa*, Hartm., as a British Plant, with records of others new to Scotland," by A. W. Bennett, F.L.S., Croydon, communicated by Dr. Macfarlane. Exhibition of *Ustilago marina*, from E. M. Holmes, F.L.S., F.R.H.S.; and *Puccinia Buxi*, from Miss C. Owen Gorey. "Report on the Progress of Vegetation at the Royal Botanic Gardens, Edinburgh," by Robert Lindsay, Curator. The weather during the month of December was characterized by great variableness and sudden changes of temperature during the greater portion, except from the 5th to the 11th, when steady frost prevailed. The rainfall was very light for December. Snow fell on the 9th and the 29th, but was slight and quickly disappeared. "Report on the Temperature and Vegetation at the Glasgow Botanic Institute," by R. Bullen, Curator.

SCOTTISH SEED AND NURSERY TRADE ASSOCIATION.

THIS Association held its tenth annual meeting in the Waterloo Hotel on Wednesday, 6th January. Mr. John Methven (of Messrs. T. Methven & Sons) occupied the chair. The annual report was read by Mr. David Hunter, S.S.C., Edinburgh, secretary and law agent of the Association, which showed that the membership comprised twenty-eight firms. The question as to the advisability of printing the first prize essay of last year by Mr. Wm. M'Intosh, Lovat Estates Office, Beauly, on "The best and most economical system for the afforestation of waste and otherwise unprofitable lands in the United Kingdom," which was remitted to the committee at the last annual meeting with power to do so if they thought proper, was settled by the committee accepting an offer by the publishers of *Forestry* to print the essay in that journal, and to supply the Association with 100 copies in pamphlet form gratis, which was done, and copies had been sent to all members of the Association. The committee had also resolved that no prize should be offered for essays during the year then current. The report was adopted. It was remitted to the committee of the Association to offer a prize for an essay connected with the seed trade, the subject to be fixed by the members of the committee.

At the close of the business proceedings over thirty gentlemen sat down to dinner. Mr. R. B. Laird, of Edinburgh and Dundee, occupied the chair, and Mr. James Watt, of Messrs. Little & Ballantyne, Carlisle, the vice-chair. The usual loyal and patriotic toasts having been drunk, the Chairman gave the toast of the evening, and in a felicitous speech touched on the material and social advantages of the Association to the Scottish seed and nursery trade.

Mr. Watt, in proposing the toast of the "Agricultural Interests of the Country," remarked on the universal and paramount importance of agriculture as an industry, pointing out that the prosperity of every other industry, but especially that of the seed and nursery trade, was intimately dependent on its being maintained in a flourishing condition. He thought the legislation of the country was against the interests of agriculture, sacrificing the well-being of the producer to that of the consumer, and considered that if the position of agriculture be neglected it would be a serious matter for the country in the event of a maritime war occurring, which would lead to our foreign food supplies being jeopardized or cut off entirely. Alluding to the presence of Mr. M'Culloch, the Parliamentary member for St. Rollox Division of Glasgow, at the banquet, who was to reply to the toast, he congratulated the Association on the fact that one so eminently qualified to speak on Scottish agriculture had been returned to St. Stephen's from Scotland, and he hoped his voice would be heard in its interests. He advised our legislators to turn their attention to the utilizing of the waste lands of the country, and said if they saw their way to creating a new class of proprietors, in that way there would accrue considerable national advantage. He had lately been in correspondence with Lord Iddesleigh on that subject, who had promised to give it his consideration by the Commission.

In replying, Mr. M'Culloch, M.P., said: Agriculture is passing—and has not yet passed—through a crisis which will render many a home unhappy, many a one desolate. Alluding to the causes of the present agricultural depression, he believed that the currency had little to do with the fall in prices, notwithstanding some high financial and economic authorities held opposite views. He held rather that the opening up of the new and fertile fields of the New World and the triumphs of engineering reducing the cost of hauling, in every way, the cheaper production and distribution by sound economy, all tend to lower prices. Reduction of rent and taxes he thought the most imperative remedy in present circumstances. Fixity of tenure he thought unsound, being only an entail of tenants, and that if rents were reduced by one-half, then it might be possible that those engaged in agriculture might yet find it the happiest as well as the oldest industry.

Other toasts of local and general interest followed, concluding with the health of the Secretary of the Association, which was given by Mr. Watt, who was complimented by Mr. Hunter in reply for having drawn out Mr. M'Culloch on a subject of such vital interest to the Association and the public at large.

NORTH-EAST CHEMICO-AGRICULTURAL SOCIETY, IRELAND.

THE usual monthly meeting of this Society was held in their offices, Upper Arthur Street, Belfast. Mr. W. Charley, D.L., presided, and said: Before calling upon Mr. Torbitt to proceed with his paper on "The Cultivation of Potatoes," he would like to ask Dr. Hodges a question on another subject. The potato had been a delicate plant for many years in Ireland, and some of that delicacy had been attributed to over-cultivation, and perhaps too much forcing in various ways. It had struck him as a peculiarity that a particular tree for many years had been exceedingly delicate in the north of Ireland, which was not in his own recollection distinguished for that weakness—the common spruce. It originally came from Norway, and for many years past it was showing evidence of disease. The leaves became withered, the plants had a weak appearance, and the timber became decayed. He found that the same feature was observable over the north of Ireland. He was not so sure about other parts of the country, but the subject of reafforesting Ireland was of great importance, and it would be well if the Society would endeavour to throw some light on this particular tree. He had given up the use of this tree, feeling that its growth was not to be depended on. He would like Dr. Hodges to say whether this was owing to the tendency to failure and the desire of nature to reproduce a different kind, or a new specimen of the same kind? He could not say whether a change of climate was sufficient to account for it. Another tree, the noble fir, placed in the most exposed situations, stood quite firm and kept its foliage, while the spruce fir, in the same position, had became decayed. It was a desirable thing to know that this variety of fir would be healthy and bear the climate, and it was equally desirable to know that the spruce fir could not be trusted.

Dr. Hodges said the first thing was to notice whether it was general or confined to certain localities; and, secondly, whether it was due to the depredations of microscopic insects.

Mr. Jellie said he could never see any weakness in the spruce fir at his place, except after heavy storms. The whole thing could be accounted for in this way: that the spruce as it developed had a very heavy top, which caught the wind in storms; for, until he had seen the root shaken after a storm, there was no more delicacy in the spruce than in the larch.

REVIEWS OF BOOKS.

The Future of the Date Palm (Phœnix dactylifera) in India. By E. Bonavia, M.D., Brigade-Surgeon, Indian Medical Department. Calcutta: Thacker, Spink, & Co.

This little book has for its object the popularizing and the extending of the cultivation of the date palm in India, both for the sake of its fruit and for the purpose of fuel. The author looks upon the fruit of the date as invaluable in times of scarcity or famine. He points out that it is precisely when owing to drought all other food products become either scarce or *nil* that the date is most reliable, and in the districts where the tree already exists and is cultivated, it is always in dry seasons that the fruit reaches its highest quality and greatest abundance. The tree has been cultivated, it appears, from time immemorial in Sindh and along the N.-W. Frontier of India, and is supposed to have been introduced by the Arab conquerors of Mooltan and Sindh about the seventh century A.D. The author gives abundant statistics to prove that the cultivation of the date is carried on in these districts with great benefit to the population, and urges on the Government to lend its aid in establishing date forests in every part of the country where it is likely to succeed. He invites also the interest and aid of private enterprise in the work, and names tracts, such as Rajputana, as very suitable for the cultivation of the tree, but in which, owing to the limited rainfall, little or nothing can at present be produced, and consequently the population is the most sparse. Copious information is given regarding the various modes of cultivation and propagation in practice, both in India and on the Persian Gulf. The book is interesting, and abounds in eminently practical suggestions on what appears to us to be an important national economic subject.

Familiar Trees and Shrubs. By G. S. Boulger, F.L.S., F.G.S. With Coloured Plates by W. H. J. Boot. London: Cassell & Company Limited.

Part 6 of this work on familiar trees is just issued, and gives an excellent popular history of the beech, one of our most familiar trees. The coloured plate represents the tree in all the glory of orange and gold of its autumn tints. The plates illustrating the "beech leaves and nut, summer and autumn," are very faithful alike in drawing and colouring.

The Farm, The Garden, and The Forest Annual for 1886. Ben. Reid & Co., the Queen's Seedsmen, Aberdeen.

A VERY useful reference for everyday use in the office of the estate or in either of the departments named in the title. It contains in handy form a large amount of general information on rural affairs upon which questions may arise at any moment; a diary for the year; hints to amateurs; lists of new and notable plants, select fruits, and select vegetable seeds; with short articles on a variety of useful topics on gardening, farming, and forestry subjects of special interest.

The Scottish Geographical Magazine. Edinburgh: Scottish Geographical Society.

THE January part of this important Magazine contains an interesting article by the Rev. William Taylor, M.A., on the Names and Places of Easter Ross, in which the author makes inquiry into the origin of the names of places in the district lying between Cromarty and Dornoch Firths, and in doing so gives much interesting evidence of the historical vicissitudes through which the district has passed under the various races which dominated it at different periods.

The Physical Condition of Waters in Estuaries is treated of by Hugh Robert Mill, B.Sc., F.R.S.E., F.C.S. The author gives tables showing the surface and bottom densities of the waters of the Firth of Forth at different places, the data for which were taken during the winter and summer months, and which show considerable divergences both as to the relative positions and the seasons at which they have been taken. Much valuable information is given in reference to the temperature, salinity, and colouring of the waters of the several firths of Scotland.

An account of the Society's education schemes and its exhibition of geographical appliances; the Proceedings of the Scottish Geographical Society; geographical notes in which much interesting information regarding our recently-acquired Burmese possessions is given, along with notices of books, maps, etc., make up a full and instructive number of this valuable Magazine.

FOREST WORK FOR THE MONTH.

ENGLAND.

THE weather of February is extremely variable and uncertain, and often unpropitious for forest planting. Last February rain fell at Greenwich upon 19 days, to a depth of 2·35 inches; and at Bristol it fell upon 17 days, to a depth of 3·345 inches.

ORCHARD.—Finish planting and pruning early in the month; and when attending to the pruning of orchard trees, see that every branch is made clear of its neighbour, and that they are so thinned that, when windy, they do not chafe together. Clean off all moss and lichen from the stems and branches, and dress the ground with fresh soil, or a good mulching of manure. Thin out raspberries, and prune and thin out gooseberry and currant bushes.

FENCES.—Finish planting thorn hedges as early as possible; and the cutting and laying of hedges should now be finished.

WOODS.—Those operations recommended for last month may be continued throughout this, under favourable conditions of the weather. Pruning should not be continued far into the month, especially upon such trees as spring early and bleed freely.

NURSERY AND PLEASURE GROUNDS.—Carry on all nursery work vigorously. Get seedlings out into nursery-rows, and when the ground is dry sow the seeds of ash, beech, cherry, chestnut, elm, hazel, holly, walnut, yew, etc. Finish putting in cuttings of planes, poplars, and willows, and the planting of layers, and relaying of stocks. Dig between the rows of plants that are not shifted, and trench into rough ridges the ground intended for fir seeds.

If the weather is mild, rhododendrons, box, and plants of this kind, that always lift with good balls of earth, may be moved with comparative safety.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

AS we enter this month, our pace should be accelerated, since it forcibly reminds us that time for the work to be done is but short.

Planting of all kinds should be executed with despatch whenever the state of the weather and the condition of the soil will admit. We would again with due respect remind planters not to plant deep, and wherever it is found that the surface is of a thick turfy nature, it should be properly pared off around where the plant is to stand. This entails fully one-third additional labour and expense, but being so eminently advantageous to the future growth and development of the tree, should not therefore be withheld. Another thing to be specially careful about is that of sheughing in the plants, never putting them in in bundles, but carefully loosing them, and spreading them out thinly along the trench, so thin indeed, that almost every plant should be put into contact with the soil; and if the season is dry, as it frequently is towards the end of the month, the plants should be watered as occasion suggests. Of all plants most easily injured by want of attention in this respect, is that of the common silver fir and holly.

Nursery work also demands full attention — lifting plants, digging, and trenching constituting the principal.

This is prominently of all others the month preferable for cutting saplings and sapwoods, and is admittedly the best for cutting ash of all kinds, whether young or old, but specially the former. Hoop-wood and under-wood of all kinds is considered best when cut at this particular season.

Birch also for brooms, heath for like purposes, or thatching, and willows or osiers for basket-making, should all severally be cut off the root. Wood of all kinds, and especially timber for industrial purposes, such as pine and fir, should as far as possible be now cut and collected to the timber yard.

Thinning young plantations, forming young hedges, pruning, digging, and renewing old ones, should also be attended to as weather and other circumstances permit.

Proceed with fencing, whether erecting new or repairing old ones, making new roads and keeping others in repair, attending to drains, and water runs in general.

C. Y. MICHIE.

CULLEN HOUSE, BANFFSHIRE,
25th January 1886.

LETTERS TO THE EDITOR.

FORESTRY IN THE CANTON VAUD.

Dear Sir,—The Swiss system of forestry has for long been held up as a model worthy of imitation by those administrators who desire to introduce a new scheme of forest management into any country which, like India or our great colonies, has suffered from the unchecked destruction of its woods. Such imitation, however, is impossible at the outset. For the word forestry, including the conservation as well as the reproduction of forests, presupposes the existence of a regular system which has engaged the care of successive generations. While the model, therefore, may be aimed at as the ultimate result of remediary measures, such measures themselves cannot be formulated, but must depend upon the condition in which administrators find the property it is intended first to restore and then to conserve.

The Canton Vaud, in common with the other cantons of the Swiss Confederation, has happily for itself enjoyed the fostering care of its forest administration for many generations, and the task, therefore, of regulating the supply of timber according to the requirements of the people, and of replanting forests periodically felled to meet such supply, is comparatively an easy one. Exceptional causes, doubtless, such as avalanches and tempests, cause a temporary difficulty and involve a temporary outlay. But generally the cost of forest administration can be almost certainly estimated, and the finances adjusted with machine-like regularity. At a time when it is sought to establish a Chair of Forestry in Scotland—the value of which, without a practical field of outdoor observation and study, is somewhat more than doubtful—it may perhaps be of service to reconsider the broad outlines of the Swiss system and the practical financial and material outcome of it.

It must not be supposed that we wish to ignore the excellent system of forest management obtaining on various estates in Scotland, the naming of any of which in particular would be invidious. These, however, are the efforts of private individuals only, having their parallel in the Forêts Particulières of Switzerland, with the additional advantage in the latter country that proprietors can obtain their seeds and plants in any number from the Government nurseries. And here it may be mentioned, as showing the extent to which this privilege is used, that the number of plants thus obtained from the State nurseries in the Canton Vaud alone was, in the year 1884, 304,880. But of State forests there are none in Scotland, nor for the matter of that in England either. For it is impossible seriously to consider the New Forest or the Windsor Woods as really State forests, although the Dean Forest may perhaps have some claim to such a title.

In each of the six arrondissements into which the Canton Vaud is for administrative purposes divided, there are to be found not only large extents of cantonal forests systematically worked and systematically reproduced, but large extents also of communal forests tended with equal care and science. A cursory glance at the more important operations in each of these may repay the reader.

Cantonal Forests.—In the year 1884 no less than 401½ kilos (the kilogramme is somewhat more than two English pounds weight) of seed were sown in the cantonal nurseries, the greater proportion being seed of the resinous trees, pine, fir, larch, Pinus sylvestris, etc.

In the same year 294,970 trees were planted in the forests, the greater proportion again being those of the pine and fir tribes. The revenues received from the sale of wood for public and private purposes—of forest trees, and of hay and other incidental products of forest lands, amounted to 376,043.19 francs, while the total expenditure was 220,037.30 francs only. The net product therefore of these forests in the year under review was 156,005.89 francs.

But while the cantonal forests are thus efficiently maintained and yet yield a substantial addition to the revenue of the State, it is in the carrying out of forestry under communal authority that the real backbone of the system is to be found, and in which lies the real secret of its success. The people generally are fully alive to the maintenance of their forests, and are in this the coadjutors, not as is too often the case wilful opposers, of the Government. Thus we find the Council of State emphatically declaring that "the communes have fulfilled their engagements with the most praiseworthy zeal." And the immense importance of the work involved by these engagements will be seen by the following figures.

The *Communal Forests* as they now exist are divided into timber forests and firewood fuel reserves. The former contain 38,494.99 hectares—the hectare being equal to about 2½ English acres—and the latter 3829.81 hectares. Not to weary our readers with too many figures, we may state roundly that in these forests combined 990 kilos of seed were sown, and 2,025,800 trees put out.

The keystone of the administration of cantonal and communal forests alike is a very simple and the only right one. It may be comprised in a single sentence, viz. the maintenance of the equilibrium between the felling and the reproduction of timber.

Equally simple also and equally effective is the principle of the management of the firewood forests. The supply is always kept somewhat in excess of the demand.

It will, of course, be remembered that in any comparison made between Switzerland and our own country, the fact must not be lost sight of that the appreciation of the advantages of forest management is unavoidably forced upon the people of Switzerland. For without the protecting barriers of trees—which are thus necessary for very existence—many of the villages would be carried away by avalanches or buried under the snows. And as little or no coal is used in the country, the people are almost wholly dependent upon firewood for fuel.

And it will also be remembered that no great exigencies of public service, such as those entailed by the pressing demands of the Government dockyards or arsenals, are forced upon the forest administration in Switzerland. Forest conservancy is in fact a comparatively easy task, and we are not likely for many years to come to manage our forests, even if they are created, with such simple regularity. But the above facts, we hope, cannot fail to be interesting to a forest-loving people such as the Scotch are and ought to be.—I am, etc.,

George Cadell,
late Indian Forest Department.

Lausanne, 31*st December* 1885.

REARING OAK PLANTATIONS FROM ACORNS.

Sir,—I note in the current month of *Forestry* an inquiry respecting the raising of a plantation of oak, whether it is most desirable to plant young trees or acorns? I also note your remarks. Having had over 40 years' experience in the woods of Herefordshire, Shropshire, and Worcestershire, I think I may be able to give your correspondent a little advice that may be useful to him.

In the first place, I would say, do not attempt to plant acorns of last year's growth, as the early frost interfered so much with the ripening of all kinds of fruit that large quantities never ripened properly. Hundreds of trees in this district might have been seen in December with a fair load of apples on, without a single leaf, and the oak trees which had a crop of acorns were studded with rooks getting the fruit because it would not drop; therefore I imagine these imperfectly developed acorns—even if they germinated—would never produce healthy and vigorous trees. If your correspondent will procure a few healthy acorns, and put them in a damp place, they will in a few days send out a tap-root which has a very sharp point, capable of penetrating to a very great depth, and through strata quite impervious to most other roots. I remember seeing some remarkably fine oak trees growing on the Downton Castle estate (Mr. Ludlow), on some Silurian rocks, with a very little depth of soil. The river Teme runs through this estate; in some places the banks are precipitous. I am afraid to say—after the lapse of some thirty-five years—how far it was from the trunk of the trees on the top to the water, but should think it might be 50 or 60 feet. I remember noticing that the roots of these trees have followed the interstices in the rocks till they had reached the bed of the river. It is thought that in most cases the tap-root of an oak will penetrate to a depth equal to the height of the tree; it is therefore of great importance that the tap-root should never be injured. There is, however, a serious drawback in growing oaks from acorns, and that is the very slow growth of the first two or three years, consequently they are very liable to destruction from hares and rabbits; a severe winter would be fatal to any number of acres, if there were only a moderate number of these animals in the neighbourhood, as hares will travel miles to feed on them.

I think the best and cheapest way of planting acorns is to plough a furrow about four inches deep, say about a yard or four feet apart, then strew the acorns thinly along the bottom, and turn the furrow back, treading it well down. I think this preferable to dibbling, as if two or three acorns should each germinate, the chances are the roots would intertwine, and it would be difficult to thin them. I do not attach much value to the cleaning of the ground, as the vegetation of grasses would be more of a protection to the young trees; but any rank vegetation, such as fern, gorse, or heather, must be kept under, or the young plants would be smothered. I recommend a thicker planting than you do, in order that a sufficient number may be left to select the best grown and most vigorous trees for standards. If there is much risk of hares or rabbits, it may be worth while to surround the plantation with wire-netting.

Your article on Drainage of Land for Plantation Purposes will render any remarks on this subject superfluous.—Yours truly,

WM. MAINWARING.

BAINFIELD, *9th January* 1886.

WHAT IS DEBENTURE WOOD?

DEAR SIR,—Can any of your readers inform me of the meaning of Debenture Wood? It is a species of mining timber, large size and partially square, and is imported from the Baltic into Hull. A friend of mine—the secretary of a large Lancashire firm of colliery proprietors, who purchase that class of timber—has spent a considerable amount of time and trouble to ascertain the meaning of it, or how it derives its name. The sellers can give no further information than that it is sold to them as such. My friend has consulted many professors of botany and etymology, scientists, and also the leading librarians throughout England, and cannot get the information required, notwithstanding that it is sold and purchased as such. It is not very likely to be wood exported upon which a duty has to be paid, because I understand there is no duty upon timber exported to this country. Again, it could hardly be said that it originally derived its name through any tax having ever been paid upon it, as under such circumstances, whatever class of timber it might be, it would be designated Debenture Wood, whereas it is only with reference to a species of mining timber. I shall be pleased to gather any information upon the subject.—Yours faithfully, C. GERRARD.

12th January 1886.

Will any of our readers kindly oblige us with the information required by Mr. Gerrard?—ED.

MISCELLANEOUS.

THE NEW SOUTH WALES BLUE-GUM TREE.—Among the native hardwood trees of the colony, the blue-gums (*E. globulus*) and stringy-bark, both lofty trees, the former sometimes exceeding 200 feet, and the latter sometimes attaining even 400 feet in height, furnish excellent timber. The blue-gum is especially valuable. Its timber is of a pale colour, heavy, strong, and durable, considered equal to English oak in transverse strength, and is most used for shipbuilding, coachbuilding, and house construction. The honour of first discovering this blue-gum in New South Wales appears, according to Mr. Nilson, to be due to the Rev. Robert Collie, F.I.S., who found it growing in the open forest near Araluen, some few years ago. The name stringy-bark is applied to a number of *Eucalypti*, some eight in all. The loftiest of all is the *E. capitellata*, the name being suggested by the furrowed, fibrous nature of its bark, which is used for thatching rural dwellings, and even making paper, while the timber is largely used for flooring boards, etc. The *E. macrorhyncha* and the *E. obliqua*, also known as messmates, have very similar characteristics. Several varieties of the peppermint tree (*E. piperita*) are also called stringy-bark for a similar reason, but the timber is inferior to that of the stringy-bark proper.

DURABILITY OF BLACK WALNUT, SASSAFRAS, AND CATALPA.—Dr. Daniel Berry writes some interesting memoranda to the St. Louis *Planter*, to illustrate the power of these woods to resist decay. In the Wabash bottoms lives a man whose business for years has been the manufacture of shingles. As the standing timber of these varieties became scarce in his neighbourhood, he hit on the novel expedient of hunting for it under ground, much in the same way as cedar logs are hunted for in the marshes of the Jersey coast. He got an iron rod and went about probing every long mound of humus and sand that looked like the grave of some ancient monarch of the forest. Strange as it may appear, he finds only the three kinds of timber—catalpa, black walnut, and sassafras—in these mounds in the order named. He has become an adept in the business. He says these are the only kinds of timber that will last long enough to enable the moss and other growth to cover and hide them as he finds them. Dr. Berry's house is covered with catalpa shingles, part of which were made from a log that, he says he has no doubt, lay on the ground a hundred years.

THE THREE YEW TREES OF CRAIGNETHAN.—Quite near to the Castle of Craignethan, immortalized by Sir Walter Scott, there stand three yew trees of very great age, which attract the attention of all who visit the castle. Very few who look at these venerable trees know the story connected with them. Some time in the Middle Ages the governor of the castle was Captain Lang, who was a brave and valiant man. On a certain day the castle was besieged by the enemy. The waters of the Nethan on that bloody day are said to have run blood, and the war-horse waded to the saddle girths in bloody gore. Captain Lang, who was sore wounded by an arrow in the breast, was borne out of the battle to a spot before the mansion-house door, to wait if possible the issue of the battle. The battle waged midst groans of the dying; at last there was heard the cry of " They run!" " Who run?" the captain called. On being told the enemy, he said, " God be praised, I have done my duty." He gave orders that he was to be buried on the spot where he lay, and three yew trees to be planted on his grave in memory of that battle. On the barbed arrow being drawn from the wound the captain expired. The lands of Chapelknowe, near the castle, " were granted to the family of Captain Lang in recognition of his services," and they remained in possession of his descendants until within the last fifty years.

PETRIFIED WOOD.—The petrified wood which is so abundant in the United States Territories of Arizona, Wyoming, and the Rocky Mountain regions, is rapidly becoming utilized by the practical American. In San Francisco there is now a factory for cutting and polishing these petrifactions into mantlepieces, tiles, tablets, and other architectural parts for which marble or slate is commonly used. Petrified wood is said to be susceptible of a finer polish than marble, or even onyx, the latter of which it is driving from the market. The raw material employed comes mostly from the forests of petrified wood along the line of the Atlantic and Pacific Railway. Several other companies have also been formed to obtain concessions of different portions of these forests. Geologists will regret the destruction of such interesting primeval remains, and some steps ought to be taken to preserve certain tracts in their original state.

CURIOUS EFFECT OF VERTICAL WIND PRESSURE UPON A TREE.—One of the strangest of cyclone freaks is recorded by a correspondent of the Pittsburg *Despatch.* The scene of it is at Washington Court House, O., and concerns an " apple tree with long, spreading, heavy branches, perhaps extending to a height of twenty-five feet. It is a tree of perhaps twenty-five years' growth, and undoubtedly has roots as stout and almost as wide-spreading as its boughs. Its trunk is not less than fifteen inches in diameter; it was a thrifty, vigorous tree, without an unsound branch, and the family have for years driven their high top buggy beneath its branches, for it shades the driveway into the yard. A short and stubby man cannot now walk under it without ducking his head. Does the reader imagine it was uprooted? That might indeed seem possible, but it is not true. Without breaking so much as a twig of its foliage, the atmosphere drove that tree right down two and a half or three feet into the ground. The hole enlarged about the base of the tree as it now stands shows how much larger is the base that has been forced beneath the surface." [We wait further explanations of this very " curious effect of vertical wind pressure," and meantime suspend our judgment.—ED.]

INCREASE OF STRENGTH IN TIMBER BY SEASONING, ETC.—It is stated as a curious fact, by a writer in the *Building News*, that one of the properties especially conducive to durability in timber is its odoriferousness—woods which are of this character being the most durable. The same authority states that the increase in strength due to seasoning in different woods is as follows:—White pine, 9 per cent.; elm, 12·3 per cent.; oak, 26·6 per cent.; ash, 44·7 per cent.; beech, 61·9 per cent. The comparative value of different woods, in respect to crushing strength and stiffness, is thus shown: Teak, 6555; English oak, 4074; ash, 3571; elm, 3468; beech, 3079; mahogany, 2571; spruce, 2532; yellow pine, 2193; sycamore, 1833; cedar, 700. Regarding the relative degree of hardness, shellbark hickory stands highest, and, calling that 100, white oak is 84; white ash, 77; dogwood, 75; white hazel, 72; apple, 70; red oak, 69; beech, 65; black walnut, 65; yellow oak, 60; white elm, 58; hard maple, 56; white cedar, 56; yellow pine, 54. Ironwood, hornbeam, almond, hard beech, teak, and thorn are of notable hardness, and, of course, very serviceable where that quality is essential.

THE finest floors are said to be seen in Russia. For those of the highest grade, tropical woods are exclusively employed. Fir and pine are never used, as in consequence of their sticky character they attract and retain dust and dirt, and thereby soon become blackened. Pitch pine, too, is liable to shrink, even after being well seasoned. The mosaic wood floors in Russia are often of extraordinary beauty. One in the Summer Palace is of small squares of ebony inlaid with mother-of-pearl. A considerable trade is done in Dantzic and Riga by exporting small blocks of oak for parquet floors.

WOOD ASHES AND THEIR USES.—We have had ample means of testing the value of wood ashes or charred earth, both as a means of warding off the attacks of slugs and other garden pests from tender vegetables, and as a material for enriching the soil, and consequently accelerating growth. The old remedy, freshly-slaked lime, if used in excess, is positively injurious to some crops, and after it has lain on the damp soil a short period it loses its burning character, and then slugs pass over it with impunity. Ashes of every kind have been used, but more especially those from wood fires, and we strongly recommend that every kind of garden refuse be converted into ashes by burning it. At this season of the year, when the thinning of shrubberies is generally receiving attention, any or every kind of trimmings may be converted into valuable ashes, as when once a good bonfire is kindled, and a glowing red heat is obtained—no matter how green the wood and leaves may be—the fire will burn away as fiercely as the driest straw-stack, if kept constantly fed with fresh material until the whole is consumed; and there is therefore no more certain way of getting rid of noxious weeds, such as couch grass, bind-weed, docks, etc., than that of passing them through the fire, as it destroys all seeds that generally abound in rubbish heaps that have been rotted away by the slow process of fermentation.

CURIOSITIES OF THE VEGETABLE KINGDOM.—It is a remarkable fact that vegetation is found alike on the mountain-top and in the depths of the sea, upon the face of the granite precipice and the surface of the stagnant pool, in the swift-flowing river and in the dark caverns of the coal mine, amid the sands of the torrid zone and in the boiling springs of Iceland. In one of these celebrated springs, where the heat of the water boils an egg in four minutes, there is a species of chara growing in great abundance. The food of the reindeer in Lapland is a lichen growing entirely beneath the snow, and there is a vegetable substance called "red snow," that grows upon the surface of the snow, and tinges it with red for miles in extent. "Blue mould," a species of fungus, in the farthest corner of a coal pit. Lichens grow upon the face of the hardest rock, and seaweed has been brought up from a depth of one hundred fathoms. And as the distribution of plants is universal, so the vitality of their seeds appears to be unlimited. We have all heard of wheat being found in the mummies imported from Egypt, which, when sown, has sprung up with as much vigour as seed of last year's produce. In a funeral barrow near Dorchester, a skeleton was dug up at a depth of 30 feet, and in the stomach of the skeleton were three seeds of raspberry, which, being sown, all came up as though they had been ordinary seeds of yesterday. This body had been in its grave 1700 years, as was proved by the presence of coins of the Roman Emperor Hadrian, which had been buried with the body.

"Ironbark."—We learn from an Australian paper that this is one of the most valuable of Australian timber trees, and grows abundantly in New South Wales. Some kinds are said to be almost indestructible in any situation, impervious alike to the white ant and the *Teredo navalis*, and, with all their defects, probably unequalled in the world for railway sleepers, piles for bridges, wharves, and jetties, fencing, or any kind of heavy carpentry, as well as shipbuilding, for beams, keelsons, sternposts, engine-beams, and other works below the line of flotation, where great strength is required and a heavy material is not objectionable. The "Ironbark" stands in the first class of Lloyd's list of shipbuilding timbers, and together with several other kinds is already extensively used by European shipbuilders. There are several kinds of Ironbark in use, all, however, true *Eucalypts*. The two best species are said to be the white narrow-leaved Ironbark (*E. crebra*), and the white, pale, or she Ironbark (*E. paniculata*), both growing in the open forest, and on poor or indifferent soil in the northern coast districts. Three other species—the red-flowering Ironbark (*E. leucoxylon*), the silver-leaved Ironbark (*E. melanophloia*), and the large-leaved Ironbark (*E. siderophloia*)—also grow in the northern districts, and make valuable timber, though inferior to the two first-named. Ironbark is largely used for bridges and piles where there is no danger of the terrible Teredo, and for poles and shafts of carriages, wheel-spokes, and railway sleepers. Owing to the difficulty of obtaining it, Ironbark is the most expensive of all New South Wales hardwoods, and has maintained its price of 20s. per 100 superficial feet, quoted fifteen years ago, although almost every other hardwood has decreased in price since then, especially during the last two or three years, the average retail price in Sydney of most of the hardwood being about 15s. The whole seaboard of New South Wales, from Cape Howe to the Richmond River, contains ridges of this splendid wood. Large shipments of it are sent from the Clarence and Richmond districts to New Zealand and to Melbourne, for bridge-building, and more especially for wharves, jetties, piles, and girders. There is some fine Ironbark country, too, on the Clyde, from which district a great deal was formerly shipped to New Zealand direct. Considering the great demand for it, the long distance it has to be drawn to the water before it can be shipped, and considering, too, its splendid properties, the price, large though it seems in comparison with that paid for other timber, can hardly be called extravagantly high.

Mechanism of a Tree.—A tree (and I beg my readers to follow this attempt at explanation closely—all depends upon it) receives its nourishment from the roots. These correspond to the mouth in the human frame. Now, as in the human frame the nourishment received is, after being supplied to the blood, exposed to the operation of air in the lungs before it is fit to give material to the body, so in a tree, the nourishment taken in at these tree mouths, the roots, passes to the lungs of the tree, and there, by contact with the air, is rendered fit to supply fresh material to the tree. These tree lungs are the leaves. This operation is effected by the passage upward from the soil around the roots, through the trunk, the branches, and every twig of the tree to the leaves, of a large quantity of water, containing in solution the nutriment for the tree. Arrived at the leaves, a process takes place which separates, by means of contact with the air, most of the water the roots had taken in, from the valuable nutriment, and throws off, in vapour, the surplus water into the air. At this time certain constituent portions of the air are utilized and mingled with the nourishment retained. This is all, now a small portion in comparison with what had arisen from the roots, yet retaining enough water to serve as a vehicle back, returned toward the roots, depositing in its way, in leaf, bark, and root, what is needed there for the growth of the tree. In these they undergo, especially in the bark, further fitting and digesting processes before they assimilate with the substance of the tree. The water which was retained to carry them down, being no longer needed, passes out at the roots. Of the extent of the provision made for evaporation by the leaves, some idea may be formed from a consideration of the number of *stomata* or stomates to be found in the leaves of plants. The number varies in different plants, for which variation a reason may be found in the different conditions of growth to which they are subjected in their several natural habitats. In the back of the leaf of the apple tree there are about twenty-four thousand stomates to the square inch. In the leaf of the lilac there are a hundred and sixty thousand of them to the square inch. In the leaves of the cherry-laurel there are none on the upper surface of the leaf, but ninety thousand have been counted on the lower surface.

Speaking of American Forests, Rev. F. H. Eggleston, of the Forestry Section of the Department of Agriculture, in relation to our forest area, gives much valuable information. From his report we find that the national domain, omitting Alaska, contains 1,856,070,400 acres. Of this large territory, 440,990,000 acres are covered with forests, and 295,650,000 acres are devoted to agriculture, or about five acres to each inhabitant. The unimproved and waste lands, including fallow fields, amount to 1,115,430,400 acres.

To traverse this domain 150,000 miles of railroad are employed, which have required 392,000,000 ties for their construction. Supposing that these ties require renewal once in every six years, and that 10,000 miles of new road are built annually, if twenty-five years be taken as the average age of trees fit for ties, it would require 15,000,000 acres of standing timber to supply the annual demand for ties, or an area equal to that of Vermont, New Hampshire, Connecticut, and Rhode Island.

The annual supply of timber consumed as fuel alone amounts to 145,778,137 cords of wood and 74,000,000 bushels of charcoal, which would clear the forests from 30,000,000 acres, or an area equal to that of New York and North Carolina together. To this estimate must be added the purely wasteful consumption of timber in the great forest fires which are a recognised feature in the year's catastrophes. This would add 10,000,000 to the grand total, and possibly more. The timber cut for lumber, though an immense drain, is comparatively small when the other statistics are considered. Altogether, then, it appears that the forest area in America is subject to an annual decrease of over 50,000,000 acres. These figures, taken in conjunction with our total forestry, furnish material for very serious reflection.

European Larch and Seeding. — The veteran horticulturist, Robert Douglas, of Waukegan, in answer to the question, Does the European larch perfect its seeds in America? says:—" I have grown hundreds of European larch cones on our own trees, and so far have never found a perfect seed in them. Some years ago a person stated that immense quantities of European larches were grown from seeds collected from his own trees. I followed the matter up very closely, and found that the seeds were imported like our own. Mr. Meehen, of the *Gardeners' Monthly*, inspected the cones from the Bartram specimen in Philadelphia, over 100 years old, and the oldest tree of the kind in America, but never found a perfect seed.

"Several years later I examined Mr. Fay's larch plantation on Cape Cod, and his brother's plantation at Lynn. On the latter, the second time I examined it, I did find two larch seedlings. Being in company with good Dr. Warder, I called his attention to them as in my opinion quite a remarkable find. Last August, while examining a plantation of foreign trees at Hanover, N. H., that had been presented to the college there some years ago, I found a large number of European larch trees as fine as I ever saw of their age. In the coolest part of this plantation, standing on two steep hill-sides and the narrow valley between, I saw a large number of larch seedlings. This fact established that which previously had been only theory to me. These larches stood in a cold, exposed situation, farther north than I had ever found larch trees of bearing age. But even here, judging from the ages of the seedlings, it is only now and then a year that European larches in this country will produce perfect seeds. The larches we sent to Minnesota planted by Leonard Hodges along the railroad between St. Paul and Duluth, I think should be now or very soon producing perfect seed. Give the European larch a cool, moist climate, and it will, I think, prove itself to be of more value than any other imported forest tree."

CLEARING FORESTS IN THE PYRENEES.—The desolation of mountain regions by the clearing of forests is strikingly illustrated in the Pyrenees. Formerly the plains were cultivated, and inundations were much less frequent and less destructive than nowadays. As roads came to be opened, the profit from sheep and cattle became greater, and the clearing of forests was begun to make room for pasturage, and to some extent for timber, until by degrees the slopes of the mountains were denuded, and the rains, having nothing to hinder, began to form eroding torrents, the south slopes suffering most, because first cleared and directly exposed to the sun's heat. The extremes of flood and drought became excessive, and extensive tracts have been ruined for present occupation from this source.

EXTENSIVE preparations are being made by the lumber firms of Ottawa, Canada, for operations on a large scale during the present winter. Great satisfaction is expressed at the proposition contained in President Cleveland's message to remove the import duty on lumber.

CHIPS.

Forest trees of immense proportions are found in Aroostook County, Me. A spruce was cut in Carlbou last week, which at a distance of 105 feet from the ground measured fourteen inches in diameter.

Connecticut gives a State bounty of ten cents for any person planting, protecting, and cultivating elm, maple, tulip, ash, basswood, oak, black walnut, hickory, apple, pear or cherry trees, not more than sixty feet apart, for or on any public highway.

Paper is made in France from the stems of the hop (*Humulus lupulus*), and it is claimed that the fibre it yields is the best substitute for rags yet obtained, as it possesses great length, strength, flexibility, and delicacy. Are our great hop-growers aware of this?

A Boston furniture manufacturer has invested 1200 dollars in a lot of English oak imported into New York, at, it is said, twenty cents a foot. A dealer has a lot of American oak which had been Englished, or "doctored," and it would puzzle an expert to tell the two woods apart.

The old idea that slow-grown timber was stronger than that grown quickly, is disproved by recent tests, so far at least as oak is concerned. Second-growth hickory is usually more valuable for handles of axes and hammers, and the annual rings show it to be of swifter growth than the first stock.

The reverence for the mistletoe among the ancient Britons appears to have been limited to what grew upon the oak; whereas the common mistletoe —the site of whose pearly berries brings the flush into the cheek of the maiden of modern days — may be gathered besides from the apple tree, the hawthorn, the lime tree, or the Scotch or the silver fir.

A gumwood pavement is being tried in St. Louis. A layer of concrete is put down and coated with sand. This is glazed with coal-tar, on which five-inch gumwood blocks are set upright with an ordinary lath between the rows at the bottom to separate them. This space is filled part way up with coal-tar, and the remainder with sand and gravel, which is rammed in compactly.

Regarding the manurial value of freshly fallen tree-leaves, it has been ascertained through the researches of Prof. Emmerling, Dr. Loges, and Herr Emeis, that beech, oak, and birch leaves contain only two to two and one-third per cent. of utilizable matter, plane up to four, the poplar and willow five to five and one-seventh per cent.

Legislating against Thistles.—The recent Indiana Legislature enacted that any person knowingly allowing Canada thistles to grow and mature upon his land, or land under his charge, shall be fined not less than five nor more than twenty dollars; and for the second and each subsequent offence, double the amount of the first fine. Supervisors of the highways of the State who allow thistles to grow on any road in their districts are subject to like penalties; as are also road-masters of railway lines who allow the pests to grow about stations or along the right of way under their supervision.

There are charcoal works at Grand Rapids, Mich., which consume 40,000 cords of wood yearly, and at which even the smoke is utilized and manufactured into chemicals by being blown by immense fans into a purifier, from which it eventually comes in the form of an acid that is clear as amber. From the acid are produced acetate of lime, alcohol, tar, and gas. Each cord of wood contains some 28,000 cubic feet of smoke, and 2,800,000 feet of smoke handled every twenty-four hours produce 12,000 pounds of acetate of lime, 200 gallons of alcohol, etc.

A Large Tree.—The other day a plane (Sycamore) tree was cut down on the estate of Woodend, Madderty, of remarkable size and quality, and is said to be the finest tree of the kind in Perthshire. The bole measured 30 feet to the first branch, and the full length of the trunk when dressed was 38 feet. It was 9 feet in circumference 5 feet from the ground, and averaged 8½ feet in circumference. It contained about 164 feet of timber, and is supposed to be upwards of 300 years old. It was sent to a timber merchant in England for shipment to India, to make rollers for manufacturing purposes.

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EDITORIAL NOTES.

We understand that a final meeting of the Executive Committee of the Forestry Exhibition took place on February 16th, when the balance of funds in hand, amounting to nearly £200, was formally transferred to the School of Forestry Committee, of which the Marquis of Lothian is President. It was also decided at the same meeting to hand over a large collection of valuable and rare specimens of woods and other forest products, which had been presented to the committee by various exhibitors, to the Director of the Museum of Science and Art, Edinburgh, for the purpose of forming part of a museum for forestry students at Edinburgh. This is encouraging and liberal on the part of the Executive Committee of the late Forestry Exhibition, and we hope it will be followed up by those who have at heart the advancement of forest science in this country with increased energy, so as to bring about the establishment of the much-wanted Forestry School.

We are informed that the Committee of the great International Industrial Exhibition, which is to be opened in Edinburgh in May next, has placed at the service of the Council of the Scottish Arboricultural Society, a suitable amount of space in the Exhibition to make an instructive display of forest products, and of articles connected with forestry. We understand it is proposed to erect a "Trophy" of carefully selected specimens from the Society's large collection; and to arrange around the court, and upon the walls, a choice selection of natural and manufactured wood articles; tools, implements, scientific instruments, books, maps, plans, etc.; all of which will form an attractive and instructive feature in the Exhibition, and prove a centre of great interest to the numerous visitors interested in forests and their products.

Destruction of Woods by the Late Storm.—We hear that in the plantations of the Auchterarder district of Perthshire many of the Scotch fir-trees have been sadly broken and disfigured by the late heavy snow. The rabbits also have done great havoc among young trees—limes, elms, and ashes being stripped of their bark round and round.

THE FEES FOR THE COURSE OF TRAINING AT THE FORESTRY SCHOOL AT COOPER'S HILL are, according to the evidence given by Mr. Pedder before the Select Committee on Forestry, fixed at £180 a year for each student. This sum covers all expenses except pocket money, viz. board and lodgings, lectures, and a six weeks' tour annually to the Forest School at Nancy. The sum is large, so large indeed as to be prohibitory to all poor aspirants for distinction in forestry science; we do not, however, say nor imply that the amount is too large to cover the expenses of the scheme on which the school is founded. This is a point we do not at present intend to touch upon. What strikes us as most objectionable in connection with these high fees is the fact, that they will narrow the field whence forestry students may be drawn, in such a way as to exclude the whole of those who may be reasonably expected to be specially fitted by the circumstances and associations of their early years to enter on the study with a bent in its favour that would assure the highest success. We allude to the sons of practical foresters and to young foresters generally. It may fairly be presumed that young men who have been associated with trees and with woodland management for many of the earlier years of their life, have acquired a large amount of information of a practical kind respecting these subjects, and also a love of trees, which not one in a thousand candidates from any other field can possibly possess. Yet this valuable element is to be excluded from the public service because they are unable to pay the fees which are required to cover the expenses of the scheme of training decided upon. Surely this is matter for deep regret from all points of view. The annual fee is in point of fact three or four times the amount of the yearly salary of the average English forester. It is therefore obvious that he cannot place his son at Cooper's Hill Forestry School, let his capacity and bent for such a career be ever so conspicuously marked. This we consider is a serious mistake, alike in national and individual interests, which should be speedily rectified by some means, either at Cooper's Hill, or by the establishment of a less costly school elsewhere. The six weeks' annual sojourn of the students in France must add very materially to the costs of the establishment at Cooper's Hill, and, it may be asked, for what good? It is difficult for any one outside the pale of officialism to conceive what practical advantage will accrue to the Indian Forest Service (in whose interests this annual Continental visit of students is planned) from a mere holiday of a few youths to the forests in connection with the school at Nancy, during which in the circumstances they can see and learn little that they may not see and learn in India, where a similar system of forest management is in practice. Obviously it must be a matter of very little consequence whether these youths reach India with or without twelve weeks of such experience, if they have undergone the course of scientific and technical training prescribed in all other respects satisfactorily. It would be incredible to suppose that such a meagre insight into the practical features of sylviculture as may be obtained in the circumstances would be considered sufficient qualification in the estimation of the authorities to place these young men in posts of responsibility—as, for instance, to direct or control labour in the forest without superior control—immediately on their arrival in India. Although we are told by the same witness in the same report that only the inferior grades of forest officers are trained in India, it is too absurd to imagine that there is no course of training for the young men who have passed at Cooper's Hill as qualified at from 19 to 24 years of age after their arrival in India. If then, as we are bound to assume is the case, these students arrive in India incapable of undertaking even subordinate responsibility in practical forest work after they have finished their course of study at Cooper's Hill, would the omission of their annual visit to Nancy of six weeks for two successive years be a regrettable matter in any way? We think not, but leave practical people to draw their own conclusions.

WASTE LANDS AND THE UNEMPLOYED.—At a time like the present, when the cry of the unemployed poor is raised on all sides for help, the suggestion that they would be profitably employed alike in their own and the public interests in the reclaiming of waste land, may well be seriously considered. In a country so small as the United Kingdom, with a climate exceptionally favourable, and a teeming population, there should practically be no waste land, because there really is comparatively little of its area except the bleak sea-coasts and the mountain tops that may not be utilized and rendered productive in one way or another. Yet in a railway ride of an hour's duration, almost anywhere the traveller may pass through thousands of acres on either hand that are unproductive of anything contributing to the wellbeing of the people in either material or labour. No benefit is obtained from these tracts of unreclaimed land by either landlord, tenant, or peasant. And it would be easy to show that their existence is not merely a negative evil, but a very positive or active one, in so far as it affects public health and climatic conditions. But that is not our present purpose, which is simply to point out that in our waste lands there is an ample field for employment for the thousands of unemployed poor that are clamouring for work in all parts of the country. We are passing through a period of extreme distress to a very large number of our able-bodied poor. Yet there is abundance of capital locked up waiting opportunity for profitable and secure investment. The reclaiming and planting of these waste lands would be both profitable and secure. It is said that the return for such outlay would be small and long deferred. That it would be some time deferred is obvious enough, but the length of time would largely depend on the management, while its value would be influenced by that consideration also, but it cannot be proven by any authentic data that where the management has been good it would be small or inconsiderable. Those who base their conclusions on this point on the present state of the timber market err in taking a view of things unwarranted by any experience. The timber market will not always remain in its present depressed state, the demand must eventually increase, and the supply, we are well assured, will decrease at no very distant date. We consider it not only a matter of personal interest, but a public duty incumbent on all owners of unreclaimed land throughout the country, to engage at once in the work of draining and trenching where necessary, and planting every acre that is not available for the higher purposes of agriculture. Were this done, there would be no need to answer the cry of the distressed labourer with a dole of charity, which, while it can only temporarily relieve his necessities, leaves him greatly poorer in his own self-respect; and the resources of the land would at the same time be developed with advantage to all concerned.

It would certainly be fitting if the Government led the way with a good example in this matter; but it cannot be said that they do so. Under the department of "Woods and Forests," they have the administration of extensive tracts of land that would bear considerable improvement with advantage to the exchequer and to the sanitary condition of certain districts in which they lie. Take, for example, the large possessions of the Government lying between Windsor Park and Aldershot. By far the larger portion of it may be described as unreclaimed or waste land, which, if judiciously treated and planted, would make some of the finest woodland in the country. Much of it, like that immediately around Aldershot camp and other low-lying parts in the district, would require draining before anything could be expected to grow upon it. But this, we should think, might have occurred to the authorities of the department as a much-needed sanitary improvement long ago. Here in one district alone, in the hands of the Government, and within easy access of London, is a field for labour sufficient to meet the immediate requirements of the whole of the able-bodied unemployed of the metropolis. The department of "Woods and Forests' is a costly one to administer, but it has always a balance to its credit, and there surely could be no better way of disposing of a considerable portion of that balance than by expending it on much-needed permanent improvements on the national property, and thus finding work for the labouring poor in these hard times. The organization of a scheme for dealing with this or any other portion of the Government lands requiring improvement should, with such a costly staff as that of the department of "Woods and Forests," be easily and expeditiously accomplished, and there is no need for a very large outlay in working plant, picks and spades being the principal tools wanted for such work.

ANGLO-CANADIAN FOREST SCHOOL.—The article on the establishment of an Anglo-Canadian School, to be found elsewhere in our present issue, will, we believe, be read with interest by all who recognise the importance of the efforts that are being put forth to secure a better appreciation of the value of the forest wealth of the empire than at present obtains in the minds of our rulers. Our contemporary the *Canadian Gazette* has, since it published the article alluded to, also published comments on the subject by Mr. Thiselton Dyer, Director of the Botanic Gardens, Kew, who gave evidence on the desirability of establishing a National Forestry School before the Select Parliamentary Committee on Forestry last summer, and Dr. Farquharson, M.P., who was a member of that Committee. The former gentleman, in commenting on the article, says "it does not appear to me to go to the root of the matter." This need not be wondered at, when it is considered that the article was obviously written to suggest and lead to discussion on a matter whose root has in no sense yet been got at. What light Mr. Thiselton Dyer's letter throws on the subject was well known beforehand to every one whose interest in improved forestry education has been awakened, but there is no attempt to sift the matter. The fact that the destruction of forests is the only feature of forestry practice at present understood in Canada, is set up as a barrier to the immediate or early establishment of a Forest School there. He says, "If, however, in the course of a few years, some men, thoroughly trained in the real art of forestry as worked out in Europe, were to obtain employment in Canada, they might establish a nucleus of a Forest School which would, at any rate, be available for the instruction of the numerous subordinate officers who are required in properly worked forests." This is a suggestion that it is evident the Canadians will act upon with a promptness and decision altogether wanting in the terms in which it is given, if we may judge from some remarks on the letter in our contemporary by Professor Fream, with whom originated the idea of an Anglo-Canadian Forestry School, with its headquarters in Canada. He says, " Mr. Thiselton Dyer's letter shows how important it is that the Dominion authorities should take this matter in hand at once. I say the Dominion authorities advisedly, because although the Provinces of Quebec and New Brunswick are certainly beginning to devote some attention to forest conservancy, yet most of the sister Provinces continue to view the subject somewhat apathetically. The approaching Indian and Colonial Exhibition seems likely to afford an admirable opportunity for action in this direction, and the Dominion should have no difficulty in securing the services of one or two thoroughly trained practical foresters who might act as instructors in the suggested school, and to whose care the management of large areas of forest lands might be entrusted." This is business-like and on the right lines. No doubt such foresters are obtainable at once if the conditions of service are made sufficiently favourable. But to wait till they are educated from our own youth would at the present rate of progress be practically waiting till by the complete destruction of the forests there would be nothing left to conserve. All that is being done at present is exclusively in the interests of India, and we think it is gravely incumbent on the Imperial Government to satisfy themselves that this question should at once be settled on a basis broad enough to meet the requirements of every section of the empire—in which forest conservancy is important. Dr. Farquharson's letter, already alluded to, treats the subject in such a broad and liberal spirit, and contains so many useful and practical suggestions on the general question of forestry education, that we take the liberty of giving it in full. He says:—

I fear that my opinion regarding the expediency of establishing a School of Forestry in Canada can really be worth very little, as I know nothing of that country or its local conditions, beyond a general impression that its woodland wealth has hitherto been somewhat neglected, and that repair has hardly balanced destruction. But in the face of the vast importance of the subject, and the comparatively little attention hitherto given to it by English-speaking races, I should gladly welcome any addition to the slender provision now made for affording real scientific instruction. I presume that the Canadian School would supplement rather than supersede others; that young men in training for official positions might, if they pleased, take up their whole course of study there, whilst those who preferred Cooper's Hill, or Edinburgh, might be encouraged, or even obliged to make a trip afterwards across the Atlantic to see how their cousins in the Dominion managed their affairs; so that the proposed school, in addition to training the numerous staff required to superintend the vast forests which until now have been apparently managed on somewhat haphazard principles, would throw the enormous material around it open to the world, and provide "clinical" instruction of the best and most varied kind to those who chose to avail themselves of it. I myself do a good deal of planting in the North, and have been anxious that my forester should be able to get some sort of training which might lift him a little out of the groove of rule-of-thumb tradition. But nothing of the kind is attainable at present, although I have to acknowledge with gratitude the courtesy with which the Hon. Mr. Bruce threw open the resources of the admirably arranged Seafield forest. What we ought to have in each of the three divisions of the kingdom is a school sufficiently well equipped with professors, and lecture-rooms, and laboratories, to turn out men fitted for regular official employment all over the world, but giving at the same time short courses of theoretical and practical instruction adapted to the wants of the forester who is to have a few thousand acres under his charge. Colonel Pearson is of opinion that two months would be sufficient for this purpose, and the only real difficulty in the way is the condition of our woods, which, on the somewhat oracular dictum of Professor Boppé, it is now the fashion to condemn most unsparingly. But it seems to me that conclusions have been drawn from that distinguished authority's evidence which careful perusal does not confirm, for in fact he admits that many of our forests, and more especially those in Scotland, are excellently well managed. His great objections are—first, that they are too young, but this is a rapidly mending fault, and many of them have really reached that state of semi-maturity which many good authorities, and notably the Germans, hold to furnish the most productive time for cutting in the present state of our markets, on the theory that we get the best value out of the ground by two short crops rather than in one, which furnishes an older class of tree for which there is now little demand. And, second, his other grounds of dissent from the current method of managing our woods are based almost exclusively on controversial questions regarding the respective merits of natural and artificial reproduction, and on, if I may venture to say so, some misapprehension of our local and climatic conditions. I therefore hold that our woods are ample in size for teaching purposes, that in many cases the financial returns from them are as good as can be expected in the present depressed state of the wood trade, and that all we now require is the opportunity of giving our foresters some chance of acquiring definite and scientific lines to guide them in the discharge of their duties. This is very urgently wanted here, and I trust that the strong recommendation in this direction which our committee is sure to make, will end in some practical arrangement of the kind. The case of Canada seems to be more pressing even than ours, and I shall look forward hopefully to the day when her Forest School of the future may work in harmonious but energetic rivalry with our own.

ON THE EMPLOYMENT OF NATIONAL FUNDS IN THE ESTABLISHMENT OF A NATIONAL SCHOOL OF FORESTRY.

BY REV. J. C. BROWN, LL.D.

IN view of the possibility of the committee, appointed at the International Forestry Exhibition, relative to the organization of a National School of Forestry, not succeeding in raising the £10,000 they deem requisite with a view to the endowment of a Professorship of Forestry in the University of Edinburgh, and in view of the possibility which there is of adapting to the requirements of a School of Forestry, arrangements in connection with the Edinburgh Museum of Science and Art, similar to those in the Royal School of Mines and Practical Geology in London, and in the Royal College of Science in Dublin, the respective museums with which they are connected,—there may be raised now the question — Would the expenditure necessary for this purpose be a legitimate application of State funds?

I think it would be so; and I desire to state a few facts bearing upon the matter. Such an application of State funds has been made in other countries; and the principle underlying this has been accepted and acted on in our own. The amount required at first need not be large; and if proper security be taken against unnecessary increase of expenditure, any increase of this would be occasioned only by a perception that the increase would increase the efficiency of the organization to an extent justifying the additional expenditure. And it is reasonable to expect that the community would be benefited by such an organization to an extent more than equivalent to the expenditure incurred.

I know more or less of, I think, every School of Forestry on the continent of Europe, comprising schools in almost every country there, and I know of none which is not maintained largely, if not exclusively, by the State. The underlying fact shows that statesmen elsewhere, under absolute and limited monarchies and under a republican form of government alike, hold that it is a legitimate application of State funds to employ what is necessary in the maintenance of a School of Forestry. And the principle has been accepted by our nation where provision, at the expense of the community, has been made not only for primary schools, but also for classes for the study of law, of divinity, of medicine, of science, and of practical applications of science. And I do not consider it necessary to go behind that fact in discussing here the principle involved.

With regard to the amount required for the initiation and somewhat extensive development of such arrangements as are in question, this will compare favourably with what is employed in the maintenance of any of the fully-equipped Schools of Forestry already existent, whether the most liberally supported or the most parsimoniously sustained, if there be any of which such a description can be given. It will also compare favourably with the provision made in this country at the expense of the State for the promotion of science and its practical application in religion, medicine, trade, manufactures, and commerce. And taking into account the numbers likely to be benefited directly, and the extent of benefit to be received by them, it will compare favourably with the expense at which hitherto the education, instruction, and training of candidates for employment in the forest service of India has been conducted, and that at which the Royal College of Science in Dublin is maintained.

It may be assumed that in all of these regard has been had to the national interests involved. And in this case there are not awanting pecuniary returns to the community to be expected; and these deserve consideration. The Select Committee of the House of Commons, previously mentioned, was appointed to inquire into the state of forestry in this country, and to consider whether by the establishment of a School of Forestry, or otherwise, our forests can be rendered more remunerative; and the question submitted by the British Association for the Advancement of Science to a committee of their number, consisting of members supposed to be conversant with forestry, of which mention has also been made, was whether our forests and woodlands might not be improved by the establishment of a School of Forestry. The report made by the former, together with evidence collected by them, is before the public; the report of the latter has not yet been made, but it is a question in regard to a matter in connection with which there are outstanding facts.

The simplest reply to be given to the question — whether the condition of our forests and woodlands might not be improved by the establishment of a School of Forestry?—is: it might. To this I may add, I have no doubt of it being so; but I have no proof to adduce in support of my belief beyond inferential conclusions from facts known to me in regard to what has occurred elsewhere.

Official reports have been issued which show, some that in India, and others that in South Africa, a great improvement in the condition of State forests has been consequent on the intrusting of the administration, supervision, or management of these to officials who had been trained in Schools of Forestry on the continent of Europe. And look where we may amongst countries on the continent of Europe, we see forests and woodlands the condition of which has been so greatly improved within the currency of the present century, that excepting for contrast with the condition in which they previously were, comparison seems out of the question. This improvement has been coincident with the establishment and maintenance of Schools of Forestry in these countries, and can be traced directly to the work of men trained in these schools.

To the inference we draw from these facts, it may be objected that in India, in South Africa, and in most of the countries on the continent of Europe, both the state of the forests and the requirements of the country are greatly different from what is the case in Britain. To such an objection my reply would be: what is attempted in existing Schools of Forestry is, not to lay down hard-and-fast prescriptions as to what must be done in any case and every case, but to impart to the students a knowledge of forest science, to show in the lecture, and, where practicable, illustrate in the forest, how this may be applied in the management of forests; and to train them how under varying circumstances to determine the varying form which that application may take. And I may add that in Denmark the state of the woodlands a few years ago did not differ greatly from the condition of many forests and woodlands in Britain; and the treatment to which they have been subjected differs in no greater degree from what is followed in other countries on the continent of Europe than is attributable to the same principle being adapted to altered conditions consequent on altered circumstances. And what has been done in Denmark might be done in Britain.

So far as I have had opportunity and occasion to formulate for myself an opinion in regard to the qualifications of foresters in Britain for the discharge of the duties to which they are called, that opinion is one of which did they know it they might perhaps be proud. But I have not found amongst them generally that knowledge of forest science, including knowledge of the physiology and pathology of arborescent vegetation, which is imparted to students in existing Schools of Forestry on the Continent; nor that knowledge of what is being done in connection with the management of forests in other countries which is imparted to the students in most of these schools.

What they have achieved in arboriculture has called forth the admiration of many, foreigners as well as others. This has been effected by the use of good common sense, employed in observing what is being done by others, and in the application to the work with which they are intrusted of principles underlying that, and of what they otherwise have learned by reading. It may possibly be the case that many a man's common sense has been impaired by school learning; but in Britain, as elsewhere, there is a general impression, which I share, that technical instruction imparted to artisans, as well by the education which it effects as by the knowledge which it imparts, is likely to qualify them for a more efficient discharge of their duties; and I cannot doubt that it would be the same with nurserymen and foresters, and with those who may have to direct them in their operations. For such instruction to such men no provision exists among the English-speaking populations of the world; and, unless some provision for this be engrafted on some existing institution, there seems to be no means by which it can be provided but by the establishment of a School of Forestry. If anything like such a School be established, and if students passing through it should resemble in fitness for their work those who pass through such institutions on the Continent, I have no doubt that whatever may be the condition of our forests and woodlands, the result will be an improvement in that condition.

The object aimed at in the most advanced forest economy of the day is threefold: the natural reproduction of forests; the progressive amelioration of them; and the maintenance of a sustained supply of products from them,—and all this it has been found practicable to accomplish in the British-like woodlands of Denmark.

In Britain the importance attached to woodlands as increasing the amenity of a residence, the importance attached to them as supplying shelter for game, and the general preference for artificial sowing and planting over a natural reproduction of woods by self-sown seeds as a means of meeting the requirements of the case, may prevent the adoption of the advanced forest management of the day in its entirety. But there is much besides comprised in this which might be beneficial to our forests and woodlands; and without some knowledge on the part of our foresters of forest science, and of applied forest science, this cannot be secured. To some extent, perhaps to a great extent, to a much greater extent than may be supposed, provision for the attainment by foresters of this knowledge might be made at less expense than would be incurred in the establishment of a School of Forestry, by extending our forest literature so as to embrace in it information on the points mentioned. There are great advantages secured by the self-educated man who, by observation, conversation, reading, and thought, fits himself for his work. But such literature as is referred to exists in the English language only to a very limited extent. By the establishment of a School of Forestry, a demand for the production of such literature beyond what at present exists might be created; and thus again directly, though not immediately, the condition of our woodlands and forests might be improved.

But I am disposed to look still further afield. It is possible, and I anticipate that it would be the case, that the colonies would derive from the establishment of a National School of Forestry perhaps more benefit than would Great Britain and Ireland. And we are taught that, as in the body so in the Church of Christ throughout the world, all is so constituted that there should be no schism in the body, but that the members should have the same care one of another, and whether one member suffer all the members suffer with it, or one member be honoured all the members rejoice with it. Whether we hold or deny that the Church should be co-extensive with the State, and the State co-extensive with the Church, or whether we reject that statement, either as a view of what is, or of what should be, we may recognise in the benefit done to the colonies a benefit to the empire, and what benefits the whole may be considered as benefiting all.

Again, the benefit to the United Kingdom, whether it be equal, be nearly equal, or be greatly inferior to that received by the colonies, may be shared largely, so largely as to appear to be almost engrossed by the teachers and officials employed, by the students, and by the landed proprietors of the country, more especially, though not exclusively, those possessed of woodlands and forests; but even these first charges may not exhaust the direct benefit to the State to be expected from such an institution; and with such knowledge of the subject as I have, I have no doubt that the direct and indirect reversionary benefit to the country would far exceed even in money value the expense incurred, if this be confined to what is really necessary. As it is with this, so is it, as if by a law of necessity, in every organization connected with the government of the State—the army, the navy, the legislature, the executive, the courts of justice, the ecclesiastical and educational establishments inclusive of churches, primary schools, and universities alike—the first to reap pecuniary benefit are the officials employed; the next to do so a portion, but only a portion of the community, and this in many cases a comparatively small portion of the community; and the community as a whole, by which the expense is met, has only the reversionary benefit to compensate it for the expenditure incurred. In view of these facts,—the acceptance by the community of the principle involved, the smallness of the amount required when compared with what is liberally granted by the nation for like objects, and the benefit likely to result to the community at large, in addition to what may result immediately to teachers and taught, to landowners at home, and to colonial dependencies abroad,—it may be admitted at once that the expenditure necessary for the establishment of a National School of Forestry would be a legitimate application of State funds, if private enterprise prove insufficient to effect the purpose.

THE SURFACE CULTURE OF FOREST TREES.

THIS seems far less attended to than it used to be, though its stimulating effects on growing plantations can hardly be overestimated. It is not merely that surface culture prevents the growth of weeds, and thus cuts off the rivalry of competing roots, but such culture mellows as well as enriches the soil, and thus increases the available supplies of plant food on any given spot. Soils stimulate growth less in proportion to the food they contain than in the ratio in which that food can be liberated. The locked corn-chest or granary may be full of corn, but while it remains locked, man and beast alike may suffer hunger and starve, though placed in closest proximity to the food stores. It is just so with the roots of plants. Thousands of forest trees are planted in soil tolerably well stored with plant food. That food is too often locked up or in with several of nature's patent locks or holdfasts, the most powerful among which being water and weeds — the first either steals the manurial worth of soils or holds them fast as in an iron vice. By preventing the entrance of or driving out the air, water completely arrests the decomposition of manure. To realize the full significance of this, decomposition may be popularly described as the cooking or preparing of the stimulating properties of soils and the richer constituents of manure, so that they become fit for use. Until thus transformed, the roots of trees or plants of any kind cannot use them. I had a very forcible illustration of this many years ago in the case of a wet portion of a field of potatoes: the land was good, manure in plenty had also been added to it, but the tops were weakly and jaundiced-looking, and the crop of tubers small and light. On digging them, however, the dung came up fresh, and almost as pungent as when applied to the sets, the water having set its seal on decomposition, and thus robbed the crop of the food provided for it in the dung. The same thing is constantly happening in plantations. It is a common thing to say of wet woods that the trees are starved from cold. It would, however, be far nearer the truth to say that they were starved from hunger. The roots in wet woods are surrounded with food in all directions but without a bit to eat, like thirsty mariners at sea, who have "water, water everywhere, but not a drop to drink."

But our second lock, though hardly so strong as the first, is also very potent in depriving or robbing the roots of plants of their legitimate supplies of food. This lock is formed of surface weeds, and it is not only a niggardly holdfast but an expert robber. A screen of surface weeds shuts out the air to a very great extent. It may, and in fact often does, become so dense as to prove almost impervious to air. When that results from a carpet of surface weeds they lock up the fertility of soils almost as completely as water. But with this wide difference, that the weeds feed on the soil themselves, and so misappropriate, that is, steal the food intended for the forest trees or other plants. By destroying the weeds, and scarifying the surface more or less deeply and frequently, we neutralize at once their miserly and peculating functions, and set free and conserve the whole feeding force of the soil for our forest trees. Surface culture does even more than this, for it admits more heat and air to the soil, both of which are stimulating forces to growth. But this may very properly be considered under our third natural lock on the fertility of soils. This is solidity—often also associated with sourness of surface. It is often the joint product of water and weeds, and may also be found where neither exists to any injurious extent. This state of surface arises from lapse of time and lack of disturbance. It is aggravated by surface floodings, the growth of inferior vegetation, such as mosses, etc. These and other causes tend to render the surface, and a proportion, or even the whole, of the tilth, impervious to air, and this imperviousness locks up the feeding properties of soils, and render these almost as powerless to foster growth as if they were not present within easy reach of the roots. For atmospheric air is not only the liberator of all the manurial forces of the soil, but is the only power that can present them in such forms to the roots of plants as to enable the latter to absorb or utilize them. More than that, some of the constituents of the air may become amongst the most valuable factors of plant food. The presence of air also quickens and enlarges the power of the roots to absorb water, and the latter, again, is not only a food of plants, but the great diluent that renders the conversion of food into plant tissues possible, as well as the preserver in useful condition of the open channels of nutrition and elaboration, through which timber and other vegetable products are built up and completed. Hence surface culture, apparently so simple, so easily attended to, so frequently neglected, may be said to be the very basis of success in timber growing. In this great national enterprise, the whole difference between substantial profit and serious loss lies mostly in the start. Give young trees a fillip at starting, they will mostly retain this great coign of vantage through the whole of their life, and this on the principle that runs through vegetable and other forms of life that like produces its like. Thus vigour results in vigour, as weakness reproduces weakness, through a deep descending series of decadences, till utter uselessness and irrecoverable loss are reached. Now, by careful attention to surface culture for the first three or five years of the youth of plantations, the majority will have made such progress that it may be almost dispensed with.

We live in stirring times. The express train has been superseded by the telegraph, the latter by the telephone. Baby beef, reaching maturity within eighteen months or two years of calfhood, is driving the beef of old-fashioned feeders out of the markets and robbing them of their profits. Timber production to be profitable must be pursued in harmony with the spirit of the times. It can be forced along in a young state, not only without injury, but with positive benefit to its future progress and the quality of its produce; and one of the cheapest modes of forcing young trees into harmony with the go-ahead spirit of the times is surface culture. It only needs labour, which is almost too plentiful as well as sufficiently cheap at the present time. The old method of sub-cropping plantations with green crops, such as potatoes, carrots, etc., paid many times over for the cost of the surface culture. The chief objection to these is that the value of the crops is so great that they were often planted too thickly, and the culture was at times too deep for the welfare of the trees. These two evils safeguarded against—these or other temporary crops may be used without injury to the trees or serious impoverishment of the soil; provided always that the present stimulus and future prosperity of the trees are held to be vital—the profits on the subcrops of mere secondary importance. But with or without subcropping, every young plantation should be subjected to skilful surface culture for the first few years of its life. The period of its profitable duration would be largely determined by the soil, situation, species of trees planted, thickness or thinness, and the mode of planting, etc. Of course it might be impracticable after the slit planting of mountains and hills, etc. But this suggests the query, whether it is ever either profitable or desirable to plant in such rough and ready methods when labour is so plentiful and cheap, and while experience proves that nothing within the domain of forestry pays so well as thorough preparation before planting, and skilful surface culture afterwards.

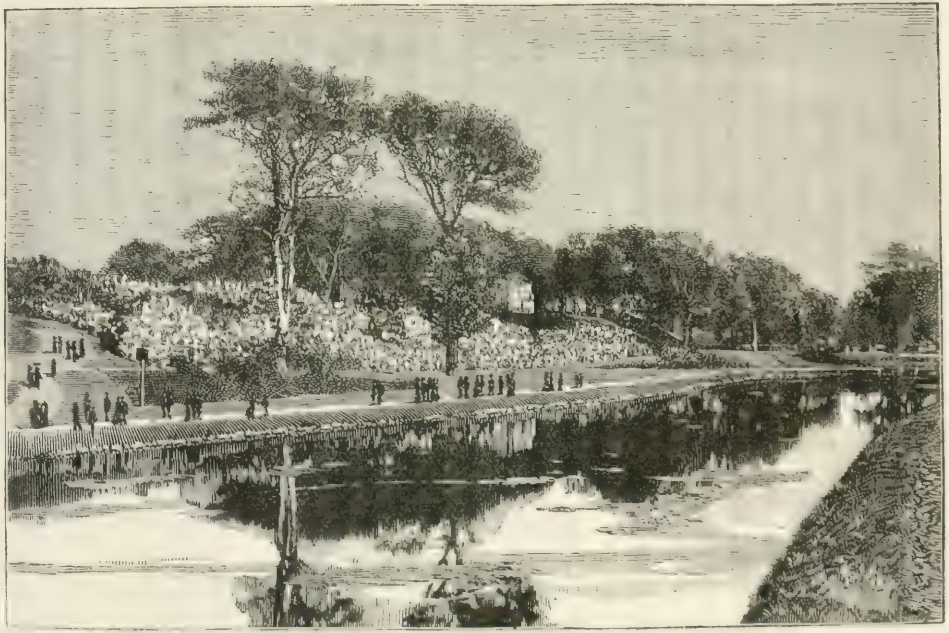
D. T. Fish.

A GLIMPSE OF THE DUTHIE PARK, ABERDEEN.

THE Granite City is perhaps more favoured than most other cities in the United Kingdom in its public parks and recreation grounds. The splendid expanse of the Links and Broad Hill on the east of the city, lying between it and the German Ocean, is hardly surpassed in its capabilities anywhere for a place of recreation for old or young—especially the latter in their games of cricket, football, and other athletic sports. And the Victoria Park, on the north side of the town, offers capital facilities for all conditions of people in quest of healthful enjoyment. But the park of parks in Aberdeen is unquestionably the Duthie Park, of which we give a " glimpse " on the opposite page.

This beautiful park owes much of its attractiveness to the lovely natural surroundings in which it is placed, more especially to the fact that the clear winding Dee washes and adorns its southern border, as is shown in the "glimpse" given. The steep, picturesquely wooded bank of the river on the Kincardineshire side contributes greatly to the charm of the scene, particularly from the interior of the park. The park was presented to the city, after being laid out and planted at her own expense, by Miss Duthie of Ruthrieston near Aberdeen, as a memorial of her uncle Mr. Walter Duthie and her brother Mr. Alexander Duthie—sons of the city of whom it is justly proud—whose memory could hardly have been commemorated by a more beautiful and enduring memorial, and which is at the same time a high benefaction to the citizens. It contains 44 acres, and was laid out in excellent taste and harmony with its surroundings by Mr. M'Kelvie, of Dundee. The space is admirably designed for the purposes of a public park, there being ample freedom provided for athletic sports and exercises, a beautiful piece of water, flower gardening in various styles, and—the crowning glory of all parks worthy of the name—there is a goodly sprinkling of old trees, which enhances and lends effect and finish to the other beautiful features, and affords shady sylvan nooks rarely found in city parks of modern construction.

The park was opened on the 27th September 1883, by H.R.H. the Princess Beatrice, and the event was celebrated with the utmost enthusiasm by the inhabitants.



DRAWBACKS TO THE AILANTHUS.

Translated for *Forestry* from the *Centralblatt für das gesammte Forstwesen.*

THE Ailanthus (*Ailanthus glandulosa*) has in recent times been largely introduced into France under the name of *Vernis du Japon* (the Japan Varnish Tree), and also into other countries. It has become quite a favourite with foresters on account of its quick growth and excellent wood, and with gardeners also, for the former reason, but more especially on account of the beauty of its foliage. It has, however, according to the most recent experience, its darker side, and we are counselled to exercise a certain forethought in its employment for planting. By these recent experiences, the hope, once entertained, of finding in this tree a means of rapidly converting bare wastes into thriving woods, has been very greatly lowered. It has been found that on account of its great sensitiveness to frost, the Ailanthus will survive only in situations where the cold is mitigated by shelter. The soil, too, for the Ailanthus must be deep and tolerably moist; for experiments with it on dry, sandy, and shallow soil have yielded very unsatisfactory results. Another disagreeable peculiarity, apt to be important in some cases, has been discovered by M. Caraven-Cachin quite recently, according to a communication in the *Chronique forestière.* In the very pungent and resinous sap of its leaves and young shoots there is contained a poisonous substance, which is dangerous for all birds, and to ducks in particular absolutely deadly. It should therefore never be planted near poultry yards, nor near waters which are frequented by ducks, for the ducks would readily reach and greedily devour the juicy leaves of its numerous root-suckers.

REMARKS ABOUT PLANTING, BOTH OLD AND NEW.

BY LOTHAR ABEL, ARCHITECT.

Translated for *Forestry* from the *Centralblatt für das gesammte Forstwesen.*

IN the earliest epochs of our era trees already excited attention and admiration. The Romans especially were fond of planting, and this they must have derived from the Greeks and from the " botanical " work of Theophrastus. We know that by the learned Hellenes it was sought to diffuse pure science among the people only under a veil of mysticism. Thus in tree-worship a means was found for saving the much menaced woods of Greece. Consequently the ancient Athenians regarded their woods as protective plantations only, and drew their timber supplies for building houses and ships from other countries. According to the notes of Dr. Chloros of Athens on Theophrastus, his work on the history and physiology of plants contains so much rich and interesting material on forest subjects, that Theophrastus has claims to be considered the founder not of botany only, but of forestry also.

It may be proved that the Greek colonies introduced into Italy the cultivation of trees, and that, following the example of Alexander the Great, they planted large tree gardens in Italy also, in order to enjoy the chase in them. Horace and others tell that in all towns forest trees were planted with great care around the dwelling-houses, although it seems that plantations were not treated in large masses in the manner of forestry. Varro, however, in his *De re rusticâ*, and some other Roman writers, make mention of trees, which were utilized in the woods by means of one single felling (*Arbores cæduæ*), and of other trees which produce stool shoots (*Succisæ repullulant*). From several such passages it may be concluded that even the Romans had some idea of forest working.

Between the Græco-Roman civilisation and that of the Middle Ages lies a great chasm, the epoch of general neglect and waste. It was not till the end of the sixteenth century, when the inaccessibility of the natural forests, which had formerly supplied timber and fuel, made itself felt,—it was not till then that a beginning was made with the laying-out of artificial plantations. In England, according to Benose, writing in 1538, and Fitzherbert, in 1539, improved agriculture necessitated hedges and beltings of trees for shelter. In ancient times in England the forests had been valued not so much for their quantities of timber and fuel, as for the number of swine which could be fed in them. But now in the sixteenth century the increasing custom of moving away from the old fortified towns and villages into isolated hamlets, led to the surrounding of dwellings with planted trees. This is the reason, too, why in still later times trees are there cultivated not for their ordinary uses only, but as objects which characterize and mark out a district.

The publication of Evelyn's *Sylva* in 1664 awakened a great taste for planting, and created in this branch of rural economy a new era. At a later period the English Society of Arts, founded in 1753, by its distribution of awards and money prizes, contributed much to the keeping of this taste alive. The splendid new edition of Evelyn's *Sylva* by Dr. Hunter, and writings on the same subject by Kennedy, Marshall, Pontey, and others, attained their object of encouraging planting. Thus it was that in England during the last century many thousands of acres of waste lands were planted with forest trees, while in Germany, where there were so many and so extensive forests, only in very few places would artificial planting have paid expenses.

The planting of forest trees for profit was unknown in former times, and even till fifty or sixty years ago the forests over the whole of Europe were very much neglected. Even the planting of the streets with rows of trees is now much more attended to than formerly, although Maria Theresa and Joseph II. in their times made laws on the subject.

A general leading principle of great importance in planting is to the effect that no land which is fit for farming should be planted with trees. Except only when there is need of shelter or distinct division or enclosure, or where unsightly objects have to be hidden, —only in such cases is there excuse for planting good farm land with trees, for such land will give higher returns under the plough.

AN ANGLO-CANADIAN FOREST SCHOOL.

THE following article appeared in the Canadian *Gazette* of January 14th, and is worthy of the attention of all interested in forest education. The idea of establishing an Anglo-Canadian Forest School may seem to be a little utopian, but doubtless there is a sound germ of prospective development. Of all the British Colonies, the Dominion of Canada possesses the greatest extent of natural forest, and the scope for a well-organized system of forest management is practically unlimited. We hope ere long to see the foundation laid of a Canadian School of Forestry; and then our forest students will resort to the Dominion for acquaintance with the North American coniferæ and instruction in sylviculture:—

Praiseworthy efforts have been made during the past few years to bring home to the public the lamentable inadequacy of the means Great Britain possesses for the teaching of forestry, and the need that exists for the establishment of an efficient forestry school. With exemplary perseverance Sir John Lubbock has brought the matter before the House of Commons again and again. A degree of success at length attended his labours; and last season, it will be recollected, the House agreed to the appointment of a Select Committee "to consider whether, by the establishment of a Forest School or otherwise our woodlands can be rendered more remunerative." It was late in the summer before the sittings of the committee could be begun. Some evidence was, however, taken, the minutes of which have been duly published, with the recommendation that, as the investigation could not be concluded, a similar committee should be nominated during the ensuing session.

It would be as undesirable as it is unnecessary for our purpose to attempt to forecast the conclusions to which this investigation may lead. But as to one fact there can be no doubt. The information so far obtained unquestionably supports the views of those who have urged the desirability of action on the lines indicated above. The witnesses examined, speaking upon the strength of long and varied experience, practically supplied unanimous testimony to this effect. Scarcely a single European country of the first rank can be named in which there will not be found one or more forest schools; and by these institutions great benefits have indisputably been conferred. The valuable work performed by the Indian Forest Department has long been known and appreciated. No expert, indeed, will question the statement that skilled training is of vast importance in regard to such matters as the selection of species, the choice of soils, the situation, the mode of planting, the manner and degree in which thinning should be carried on, and the time at which timber should be felled; or that the application of such knowledge would prove of immense advantage in the management of our woodlands and the production of timber. Yet, as matters now are, no facilities of any kind exist by which this needful training can be obtained. The comparatively small number of foresters required for Imperial service in India have to be sent abroad to acquire, under obvious disadvantages, the practical instruction which is recognised as essential for the proper care of the forests in the East. Even from this rapid survey of the facts the conclusion seems irresistible that some action should be taken to make good this gap in our educational system; and it is not surprising to find a considerable movement in this direction springing up in Scotland and elsewhere.

It must be admitted, however, that complete unanimity does not exist as to the best method of meeting the difficulty. The Imperial authorities have at last recognised the inconveniences resulting from the present system of training officers for the Indian Department. Experience has shown that the students sent by them to Nancy are not sufficiently familiar with the French language to follow the lectures, or to do themselves justice in the examinations which it is incumbent upon them to pass as well as the French students. In any case, loss of time must be caused by the use of a foreign language; the difference between the technical terms in England and France presents an additional difficulty; and political considerations cannot wholly be ignored, as, in fact, events have shown. Hence the decision has been arrived at to arrange for the training of the students of the Indian Forest Department at the Royal Engineering College at Cooper's Hill. In all probability this section of the College will be thrown open to other than students of the department; and it has been suggested, with some show of plausibility, that if this action is supplemented by the establishment of a Forest School at Edinburgh all reasonable demands will be complied with. But apart from the costliness of a course of study at Cooper's Hill, and the consequently very narrow limitations of the sphere of usefulness of that institution as a training school for British foresters, a serious and fundamental objection to this proposal is immediately patent. How can proper forestry instruction be given in a country which possesses no woodlands of sufficient size to meet the requirements of such a school? The opinion of M. Boppé, the well-known French expert, has been sought by the Government. A special visit was paid by him to this country, and, after a tour of inspection, his reply to the question whether the English and Scotch forests were in such a condition as to enable the Indian forest students to be trained in them with advantage, was emphatically in the negative. "It is a matter of regret," he wrote, "that among all the forests visited by us in our travels, there is not a single one suitable for the teaching of sylviculture on the broad basis so essential when the pupils are called upon to apply it in all quarters of the globe." It is needless to enlarge upon this point. A slight acquaintance with British woodlands is sufficient to confirm the assertion. The end in view cannot be attained "by utilizing young plantations recently created by the hand of man," or plantations too old, or too much overworked, to be available for scientific instruction; and to one or other of these categories all English and Scotch forests must be relegated.

But this difficulty is not, we believe, insurmountable; and one suggestion has recently been thrown out for which it is highly desirable to obtain serious consideration. As we mentioned not long since, Professor Fream, in discussing Canadian agriculture in the *Journal* of the Royal Society of Agriculture, proposes the establishment "of a thoroughly equipped Forest School in Canada, the cost or part of the cost of which might be jointly borne by the Dominion and the Imperial Governments." And many forcible reasons can be urged in favour of the proposition. The instruction would then be given in what Professor Fream rightly describes as the greatest forest region in the world. Canadians are gradually becoming alive to the necessity of greater care in the preservation of one of the most valuable of the natural resources of the Dominion. With us, they require the establishment of some recognised centres whence information could be disseminated, and sound views promulgated on the subject. It would seem, therefore, safe to count upon their active co-operation in such action as Professor Fream advocates. If distance be urged as an objection, it is sufficient to reply that "the school could be reached in less than a fortnight from any part of the United Kingdom, and cheap ocean fares and inexpensive living in the Canadian Forest School would add to the attractiveness of such an institution. Above all, it should be remembered that the subject has more than merely local bearings. As M. Boppé points out, the total extent of the forests in the British Empire is to be reckoned in hundreds of millions of acres; and it is a matter of the greatest Imperial importance that this vast accumulation of forest wealth should be turned to the best account, not squandered away through ignorance or neglect. Hitherto applications from different parts of the Empire for the services of competent forest officials have been met, if at all, with the greatest difficulty. And if the Imperial authorities are to be asked to adopt some measures calculated to promote the interests of British forestry, it is not inopportune to urge that the policy to be pursued should be Imperial in its scope and aim. In no part of the Empire can it be contended that equal facilities for thorough training in forestry will be found with the same proximity to the mother country as in the case of Canada. And it is to be hoped that no effort will be spared to demonstrate the feasibility of establishing there, upon some such basis as we have roughly sketched, a school which would afford admirable means for the education of efficient foresters, by whom the much-desired improvement in British sylviculture would be brought about, and the timber supply of the Dominion would be carefully protected and fostered, and by whom, too, similar valuable services could be rendered in distant parts of the Empire.

THE RESUSCITATION OF CHOICE TREES BY TOP-DRESSING.

SPECIMEN trees on lawns often suffer in health, and have their beauty impaired, if not quite destroyed, by sheer impoverishment. Nor is this to be wondered at, for nature's true restorers, decomposing grasses or other plants, and dead leaves, are sedulously swept up and carried far away from the roots. The results of those dual processes of depletion tell at length on the strongest trees and the richest soils. If it be true, and it is, that all work and no play makes Jack a dull boy, it is yet more true that all out and nothing returned will make the richest soil poor. And yet in practice how few act upon this mere truism ? Depletion and robbery of the replenishment provided by nature goes on year after year until valuable trees are exhausted and stunted past recovery, and not a few cultivators affect to marvel at these failures. The marvel would be infinitely greater were the trees not to suffer and fail. Happily the remedy for such evils are as simple and easy as their cause is obvious. Either leave the natural resuscitators to do their legitimate work, or provide substitutes of equal or greater value. As the first course may create what fastidious fashion has mostly designated eyesores, the second plan of less unsightly substitutes must be adopted.

After trying a good many such, I have never found any to equal, on the whole, a top-dressing of maiden loam, at once light and rich. Loams from old pastures laid up to mellow a season one or two years before use, are best for the top-dressing of trees. The fibre gets partially decomposed during the period of storage, and the loam is consequently in better condition for feeding the roots.

Details as to time and depth may be very varied, without greatly lessening the value of the effects. Often and little is, however, most effective, especially in the case of trees that have their roots turfed over. The mere removal of the turf in such cases and its replacement not seldom acts as a stimulant to the roots. But the addition of from half-an-inch to three inches of fresh sweet loam adds greatly to the stimulating effect of the surface disturbance.

This brings us to another point, which is to note that to derive the maximum of benefit from these top-dressings no turf should be laid over them at all; comparatively loose surface enables the roots to get the full benefit of the top-dressing. And if this can be maintained from the first, the trees will thrive better than when their roots are turfed over.

As to the area of the dressings, they should extend from the bole to a foot or yard beyond the circumference of the under branches. The character of the trees and of their roots should be taken into consideration. For example, oaks do not run so wide as beeches, nor upright cypresses as Lebanon cedars.

Only experience can fully inform the practical man on these matters, and his object will ever be to apply the top-dressing where the roots are most likely to find it. Amateur tree-growers, however, may rest assured that the roots will soon make tracks for the new food, for the instincts of roots towards a new or full larder are as trustworthy as those of boys in the direction of the apple orchard. Failing loam, the next best top-dresser is, on the whole, cocoa-fibre refuse. It is less feeding, and perhaps almost more conservative alike of heat and moisture, also free from offensive odour, decomposes very slowly, and finally forms a fine mould of which the roots of all trees seem specially fond. Manures of all kind need much more caution and skill in their preparation and application. Farmyard manure is a definition as vague as it is dangerous. Well-rotted is also too vague to be safely acted upon. The surest means of diluting its strength down to safety point for the top-dressing of trees is to pass it through a year of hot-bed experience. The long-sustained decomposition and the lapse of time will then have eliminated its cruder substances and stronger gases. But until almost fine as mould and sweet as maiden loam it is hardly fit to apply as top-dressing to the roots of choice trees. And yet I have seen the rank dung of pigs, bullocks, and pigeons applied to the roots of Auracarias, Wellingtonias, and other choice conifers. Is it any wonder that the place that once knew them now knows them no more?

Leaf-mould is almost as dangerous as rank manure. For if the latter kills plants through the strength of its excrements and the pungency of its gases, the former destroys them even more rapidly with its hosts of fungoids, which prey on the living roots to their sudden paralysis or complete destruction.

As maiden loam and cocoa-fibre refuse exhausts our list of safe top-dressings for choice trees, liquid dressing seems almost a misnomer. But these in dry weather form the most prompt and efficient, especially among conifers. A hose of water laid over the roots for an hour or two hours proves the most stimulating and wholesome dressing in arid localities. Many parts, perhaps the larger area of England, are too dry for coniferous trees; and an abnormally dry season checks growth, and disfigures and destroys thousands of trees that the water-hose or the diversion of a natural stream of water might have saved.

Very weak sewage and soot water have also proved useful liquid dressings for coniferous and other trees, as well as rhododendrons and the majority of shrubs.

But perhaps more than enough has been stated to recommend those readers who are specially interested in the rapid growth and luxuriant health of specimen trees on lawns and pleasure-grounds to try top-dressing with maiden loam and cocoa-fibre refuse.

D. T. FISH.

THE REDWOODS OF NORTHERN CALIFORNIA.

OF Californian trees, the most noted are the *Sequoias.* These are of two distinct genera — the *Wellingtonia* (*Sequoia*) *gigantea,* or big or mammoth trees, and the true *Sequoia sempervirens,* or redwood.

The big trees grow only on the Sierra Nevada mountains, at an altitude of 4500 feet and upwards, within latitudes 37° to 39°, in groves of several hundred trees, and also scattered through the forest. They have been described by innumerable visitors—every passer through San Francisco, who has a couple of days to spare, not failing to make an excursion to one or other of the groves—and it is not proposed here to make further mention of them.

Similar to the big trees, in almost every particular except size, is the redwood already noticed. Even in size this difference would not be strikingly apparent unless the trees were to be placed side by side, and even then the redwood would be pronounced the more graceful of the two, for from a base but half the girth of a big tree will spring a shaft almost as high.

But its gracefulness as seen in its forests, and the picturesqueness of these forests as viewed from some mountain top from whence the eye can trace each river valley clothed in the never-fading greenery of its foliage, is never seen by the visitor to California who keeps to the beaten track. This tree is found only on the coast, from the 37th parallel northwards to the Oregon boundary, lining the banks of the rivers and "creeks" for from twelve to fifteen miles inland from their debouchment; the largest forests are on Russian River, Sonoma County, and on Mad River, Humboldt County. A creature of fog, it is never to be found where that does not penetrate. During the summer months the wind blows from the north-west with great regularity, and during the forenoon the vapour from the mild Pacific is, by it, banked up some miles from the shore. Later in the day the wind increases and the fog is driven inland; detached masses first come in like flying squadrons overhead, then the body of it follows, sweeping up the river valleys, creeping through the foliage of the tallest trees, crawling over the hill tops and down the opposite slopes, and filling up the canons, till soon hill and valley are enveloped in dripping mist. The foliage of the redwood condenses this mist, converting it into rain, thus supplying moisture to the roots during the long rainless summer. The fog continues throughout the night, and generally disappears with sunrise or before mid-day; and a beautiful sight it is to watch, from some high place, its dispersion by the sun as it rolls away from the ridges and valleys, disclosing the trees or pastures of some well-known spot, and again covering them up to open more and more widely at some other place, till at length through the thinning mist the rivers begin to sparkle in the sunlight far below like silver threads, and over all reigns the Californian sky of cloudless blue.

Within the forest the trees grow from 6 to 30 feet apart, up to 50 feet in girth, and up to 300 feet in height; the shaft being clear of its short twisted branches and cedar-like foliage for more than half-way up, and the bark of a rusty cinnamon colour. Over 2000 annual rings have been counted in one 45 feet in girth. Plenty seedlings are to be found, sprung from its small-sized cones, but these will not bear transplanting from their native clime, and the slightest frost will kill them.

Take a ride in a Humboldt forest.—How refreshing is its shelter from the scorching sun.—Yet it is not gloomy.—Here are several acres of ground covered with rhododendron in blossom; up the trees creeps the poison oak with its delicate leaves, green, pink, and crimson. Here is also the Oregon grape vine, the thimbleberry, huge ferns, and a tangled growth of brushwood, all lightened up by long yellow splinters from above. Occasionally the "trail" will run through a little opening, sparsely covered with grass, where the eye, having room, naturally follows the course of the glancing sunlit grey and cinnamon coloured giants from base to tip in a vain endeavour to take in their size, and from whence the blue sky above may be seen as from the bottom of a well. Nowhere is sunlight more beautiful, and to the traveller who may have begun his journey before the wetting fog had cleared away, nowhere more cheering; *now* he can see and avoid stumps, roots, and quagmires; now he leaves off shivering, and by and by ties his coat to the saddle, and it may be takes to singing and shouting to relieve the tiresome monotony of the forest trail. Some, however, cannot sing or shout amid such scenes. It is a land of silence.—Halt a moment.—Not a sound of bird, of beast, or of wind disturbs the forest; even the few small streams steal quietly on their way in their deep cut channels.—Go for mile after mile amongst trees packed as closely it would seem as trees can stand, and where at places a deep gloomy shade prevails. Here are old fallen trunks lying rotting, piled one upon another,—there stands a rugged monster with a huge cavern burned deep into its base; a cave which could hold a dozen horses, or another still stands, blackened and serrated to a hundred feet from the ground by the fires of centuries past. The ear is strained to catch the "thud" of an axe or the shouts of the drivers of an ox team hauling logs, yet one only hears the twitter of some little mite of a bird seeking insects amongst the bark. The way seems longer than it really is, the expectation of the traveller being always alive, hoping that the next turn may reveal a clearing and logging camp, or that the neigh of the horses in the "corral" of the stopping house may be soon heard and answered by his own tired steed,—the road is ever the same, and there is nothing to divert his attention. It may chance, however, that the traveller comes upon the cabin of a shingle-splitter, and may find the splitter himself further on, splitting out "shingles" and "shakes," such as are used in California instead of slates for roofing. The shingle-splitter works in parts of the forest from whence, owing to the nature of the ground, it is difficult to remove the timber to the mills. He selects a straight tree, and tests if it seems free from twist by making a deep cutting in its side and examining the grain. Should it prove satisfactory, he and his mate erect a staging around it, at 5 to 12 feet from the ground (so that the workable timber may be free from the bosses and twistings of the roots), and cut it down by axe after two or three days' work. A large proportion of these woodsmen are Canadians—"bluenoses" from New Brunswick—and are, as might be expected, experts with the axe; and to show their skill, they will, if there be onlookers, throw a tree between two stakes fixed a hundred and fifty feet off, or will lay it exactly in a bed of brushwood prepared for it if the curvature of the ground requires such a bed; for it is a brittle timber, and if carelessly felled may be shivered into long splinters. Often a tree will spring forward 20 feet and more in falling, especially if felled downwards on a slope; and when full of sap will sometimes split the bark open, and shoot clear out of it; they are generally felled to fall upwards, however. The felled tree is denuded of its bark, one to two feet in thickness, by means of sharpened crowbars, the branches are lopped off, and a section—one and a half feet in length if for shingles, or three feet if for shakes—is sawn off the trunk, and split into blocks of about 10 inches in width, and from these blocks the thin shingles are rapidly split by means of a "frow" or broad-bladed knife with handle set upright. If the trial shingles cut prove to be perfectly flat, then more sections are sawn off the trunk, and the tree is worked up; but if, as sometimes happens, a twist is shown, the fallen mass must be abandoned till such time as a railroad is extended to the spot. Such abandoned trunks, partly worked, give the appearance of great and useless waste. The traveller may next come upon a waggon loaded with these shingles, perhaps in a tight place among the stumps, or sunk to the axles in a quagmire; or he may meet a couple of wild "vaqueros" driving cattle; or he may have to give way to a train of mules loaded with wool from the mountains beyond the redwoods.

But what is that strange sound ?—The traveller stops to listen.—Yes—it is the whistle of a locomotive which comes faintly to the ear,—signs of his journey's end. That is well, for the forest near sunset grows suddenly dark. Again he hears a sound as of a horn—he meets the woodsmen straggling into camp—he learns that it is yet some miles to the stopping house, and he is glad to accept the invitation of the "Boss" to stop over night. The horse is picketed to a stump, a refreshing wash is had at the washing trough, "supper" is called, and the men by batches sit down to a well-provided table in the kitchen, an arrangement which serves well enough, as some are longer of arriving from their work than others. Afterwards pipes are smoked around a huge fire till nine o'clock, by which time most have crawled off to their bunks in the cabins near.

Perhaps in the morning a ride is had on the flat cars into the woods for logs. Here is a team of twelve oxen "snaking" a huge section of a trunk—a log sixteen or perhaps twenty feet in length—along. The lower edge of the cut has been smoothed off to let the log slip easily along, sled-like. It is brought side on to one of the cars which has some timbers put sloping against its side, a turn or two of a chain is then taken round the log, the under end of this chain is fixed to the car or to a stump beyond it, and the other being led over the car and attached to a team of oxen, the log is by them easily trundled up the timbers into its place in the waggon; but generally it requires a couple of waggons to carry each log. The train loaded, is run direct to mill, or it may be to the nearest tidewater creek, into which the logs are "dumped," and floated down the bay to the mills at Eureka.

Railroads are being pushed further and further into the forest, and though they furnish evidence of commercial prosperity, no one can contemplate the wholesale destruction they bring without feelings of sadness. Nothing can be conceived more desolate-looking and ragged and uncouth than the land over which the woodsmen have passed, and nothing more apt to excite condemnation than the seeming wanton waste of timber they leave behind them. Redwood land, however, is rich, and soon a growth of fir, brushwood, and ferns, covers the ground; occasionally, too, the stumps will bud afresh, if not blackened by fire, and become like shapely bushes.

Of this redwood nearly every house in California is built and shingled; and whether cottage, or the palace of some railway or Bonanza king, these are—white painted, and with cool verandahs, clustered with creepers—generally light and elegant. The fields are fenced with it, and its durability is unquestionable, as pickets and rails, twenty years old, stand sound attesting the fact. For railroad "ties" or sleepers it is the best wood known, as it resists the action of both air and water. Every train that crosses the Sierras rolls over the product of the redwood forest, and it has been laid on the Andean railroad, and in Colorado and elsewhere. The sawn lumber is, besides, exported to Australia, South America, and the islands of the Pacific.

The wood is close-grained and can be split into boards of any length and thickness, into shingles or shakes for roofing, or into pickets, rails, and posts for fencing, or into ties for railroads. Its colour when first split is light red, but it turns dark when exposed to weather: it has the merit of retaining its place without warp or shrinkage, if seasoned but for a few days, and of late the refuse of the mills has been worked up into doors, cornice mouldings, and furniture of various kinds.

Very different estimates are made as to the length of time the supply of redwood will last at present rate of consumption. Some will take the length of the coast-line of the districts where it grows, and also from twelve to fifteen miles inland, give 100,000 feet to the acre, and say that it will last fifty, or it may be a hundred years; while some will fancy that the unbroken forests which, tier upon tier, bound the limit of vision, are still of redwood, and will speak of the supply as inexhaustible. A more moderate estimate than any of these will, however, probably be the correct one. Already in Sonoma County, timber, which a few years ago would have been rejected, is now worked up.

In the Forestry Exhibition held at Edinburgh in the summer of 1884, there was exhibited a portion of a redwood tree, which formed a little chamber, the floor of which was formed of a slab of wood thirteen feet in diameter, and the walls by pieces of the bark nearly two feet in thickness, and about twelve feet in height, which were placed in the position they had occupied when the tree was growing. This tree had been 295 feet high, and the rings had shown that it was over 2000 years old, and from it had been cut 6250 cubic feet of timber, or of clean lumber free from knots 75,000 feet by board measure.

Much more could be written of the other products and of the scenery of this portion of California, of its flocks and herds, its "gold bluffs" where the sea-sand yields gold, of its rivers, of snow-crowned Shasta and of lesser mountains, but space is limited, etc. etc.

TREES OF MONMOUTHSHIRE.

BY "YOUNG FORESTER."

THE BEECH (FAGUS SYLVATICA).

THE Beech tree in this county is very plentiful, but of clean dimensions it is not easy to obtain. The clean trees seem to be all growing in places where their ornamental value is preferred to that of the wood. You will see the highest trees growing on our gradual slopes, where there is a good loamy soil on gravel. There are several large trees growing in many parts of this country. Perhaps one of the largest grew at Pontheer near Caerleon. I am unable to obtain its exact dimensions, owing to it having been felled some time ago. I learn from a very good authority that this tree had a height of about 50 feet, with a circumference of 25 to 30 feet. There are also some very fine trees growing in Llantamam Park; a place worthy of a visit to any lover of arboriculture. They have boles of considerable dimensions, with large and ponderous limbs. The soil which seems to be best adapted to the growth of the beech, is a loamy soil on gravel. I have seen some very clean beech trees growing in a red clay on red sandstone, but I have always noticed that in cutting beech up that has been grown on the red sandstone, it turns out to be much harder than that grown in a loam on gravel. Many people seem to be very prejudiced about the use of the timber of the beech. I have proved the beech in many instances to equal the elm. About here the timber is used with chairmakers, millwrights, and sometimes with wheelwrights. The beech is a very good timber for all under-water work, wedges, and it makes very good felloes for light coach wheels, when allowed to dry well before using. There are still many belts of land that could be profitably planted with this tree, and while the landlords were adding to the beauty of their estates, they would be adding to their wealth. Farmers about here seem greatly opposed to hedgerow planting. They say nothing grows well under the branches of the trees; but I believe if hedgerow trees were properly pruned, there would be little cause of complaint.

THE SCOTCH FIR OR PINE (PINUS SYLVESTRIS).

The Scotch Pine presents in many parts of this county a very striking and handsome appearance, especially when planted in groves and along drives, with deciduous trees intermixed with them. While our oak, ash, and beech, with others, have lost their foliage, and the earth seems to be at rest, the Scotch pine gives tone and beauty to the landscape with its bright foliage and the lustrous effect of its gold-red bark, as glimpses of it are caught by the eye, in striking contrast to the more sombre tints of the surrounding deciduous trees. There has never been enough of notice taken in this county of the Scotch pine. It cannot be from its not flourishing in our soil. There are now standing at Llangibby, Skiberwen, and Beitholey in this county, some noble specimens of the Scotch pine. Some of these trees are from 70 to 100 feet in height, with a circumference of 15 to 20 feet. I measured two very fine specimens last spring. They were growing in a position not too exposed, and in a loamy, sandy clay on gravel. Their dimensions were as follows:—No. 1 measured, after having its top cut into pit-wood, 49 feet in height, with a circumference of 8 feet 6 inches. No. 2 measured 30 feet in height, with a circumference of 7 feet 9 inches, 5 feet from the ground. Both of these trees had very good heads of foliage. Some of the branches measured 3 to 5 feet in circumference. These trees after being felled fetched 9½d. per cubic foot delivered at Newport station. This pine will grow in almost every kind of soil we have in this county—the drier the better. From my observations, it grows best in a good dry sandy loam. Heavy clay seems to be adverse to the nature of this tree; so does low-lying situations. The few trees that are to be found on our moors are very small and sickly-looking; but on elevated positions with dry soils they grow very rapidly, and soon reach valuable dimensions.

Mixed plantations of Scotch pine and larch in some places have not succeeded, the larch having sickened and died, while the Scotch pine continues to do well. The Scotch pine is a hardy, quick-growing tree, and I hope that our authorities and landowners will soon see that the barren hills of Monmouthshire and Wales could, instead of being turned to account in starving the few miserable-looking sheep and ponies which run over them, be planted with Scotch pine and larch, which would soon yield ample returns on capital so invested. How long shall we have to wait before we see this done?

I do hope that every one interested in the beautifying of this county and every other part of Wales, will do their utmost to bring about the planting of all barren hillsides; then, instead of barren hillsides, we should have them clothed with profitable timber, which would improve the climate, beautify the landscape, increase the wealth of the landlords, and give employment to many of the unemployed; and instead of importing thousands of tons of French and other pit-wood into Newport, Cardiff, and Swansea, as we do now, we should be able to meet the demand with Welsh-grown timber.

THE JAPAN CEDAR

(*Cryptomeria Japonica*).

FORTY-ONE years ago, or during 1844, the Horticultural Society of London, through their collector, Mr. Robert Fortune, sent seeds of the above interesting tree from Shanghai, the produce of which has now in this country attained, in several instances at least, heights varying from 60 feet to 75 feet—rapid growth, it must be admitted, for a Japanese conifer in Britain. Delighting and thriving most luxuriantly in cool, damp soils, the humid atmosphere of Great Britain is peculiarly well suited for the successful cultivation of this handsome conifer. When seen at its best, the Japan Cedar is a tall, portly tree, of somewhat conical habit of growth, with a clean, straight stem of fully 100 feet high, and 4 feet or so in diameter.

The branches spread horizontally, are slightly drooping with up-curved tips, the lateral ones dividing into numerous frondose branchlets, thickly covered with bright, glossy green foliage.

Leaves fully half-an-inch in length, rigid, incurved or awl-shaped, and oppressed to the stem, obscurely quadrangular, and marked rather indistinctly with two glaucous silvery lines beneath. The flowers are monœcious, or both male and female on the same plant. Male catkins of an oval or oblong shape, and produced in great abundance in the axils of the leaves at the extremities of the branchlets. Cones globular, about three-quarters of an inch in diameter, terminal, singly, and usually erect. This distinct and beautiful conifer, although at first branded with a semi-tender character, is found to be perfectly hardy, sound in constitution, of very rapid growth after it has become thoroughly established, and by no means fastidious as to soil or situation, provided the former be naturally sweet and healthy, or artificially made so. Although usually asserted that this tree only thrives, or at least thrives best, on damp soil and in low sheltered situations, a comparison of the trees growing in Penrhyn Park and in other situations over the estate, hardly upholds this theory, for some of our most luxuriant specimens are growing in deep, sandy loam, with the happy medium of neither excess nor want of moisture. Judging from the specimens here, I should say plant the *Cryptomeria* in good dampish, but not stiff loam, where partial shelter is afforded, and all the better if in a shadyish situation—by this I mean a northern or eastern aspect, where direct sunshine is prevented. Better, indeed, than the generality of coniferous trees, the Japan Cedar seems to thrive in the dense, still air of mid-woodland, and is even not fastidious about the juxtaposition of surrounding trees, so as their extending branches do not actually commingle with its own. By far the finest specimen of this tree that I have seen is growing in a low-lying and well-sheltered piece of ground near our home nursery. The soil is deep, damp, and rich, being principally composed of vegetable matter in an advanced state of decomposition, and resting on a compound or commixture of earth and stones, while a running stream in close contiguity seems to contribute in no small degree to its general welfare, preventing at least, even during our hottest summers, the possibility of a dust-dry state of the soil. It is perhaps incorrect of me to say that this is our finest specimen, for there are several others of larger dimensions, but the position it occupies being considerably below the road level and eye of the observer certainly enhances its appearance in no small degree. It is 60 feet in height, girths at 3 feet and 5 feet, 4 feet 8 inches and 4 feet 6 inches respectively. Another, growing within a hundred yards of the sea at Port Penrhyn, and on rather stiff sandy loam, girths 5 feet and 5 feet 2 inches at 3 feet and 5 feet up the stem; while on the drive edge, near the grand entrance, is one of like proportions.

The taper in the stems of these trees is very inconsiderable, the girth at 18 feet or 20 feet being little less than that at 3 feet. In very damp situations we have, however, found that this tree succeeds but very indifferently, the rate of growth being slow, and the foliage somewhat sparse, and wanting in the deep, silky green that is so noticeable in luxuriant specimens. No conifer with which I am acquainted produces cones in such profusion as the *Cryptomeria*, some of the largest trees in the park here being literally covered from base to apex, not an unfertile branchlet being noticeable in several that I lately examined. Even in young plants, when hardly 4 feet high, and still under the nurseryman's care, cones are produced pretty freely, not in all cases, but commonly enough. A peculiarity of the cones is that the axes elongate and bear foliage leaves at their apices, thus imitating in a marked degree those of *Cunninghamia sinensis* and several species of spruce.

This prolonged axis of the *Cryptomeria* cone differs considerably, however, from that of the *Cunninghamia*, which produces side-shoots from the prolonged axis, what I have never noticed in those of the tree under consideration.

In the *Cryptomeria* the prolonged axis dies off the same season it is formed, whereas in the *Cunninghamia* this is not the case, the elongated portion emitting new shoots, as in an ordinary branchlet.

Both in Japan and China, into which latter country it is generally supposed to have been introduced, this tree is largely employed for ornamental planting, such as in the formation of avenues, for clumps and groves, and as single specimens in the gardens and grounds.

In Japan there is an avenue of fully thirty miles in length closely planted with this tree, while others of shorter lengths are not uncommon.

The timber of *Cryptomeria Japonica* is light but lasting, and largely employed for room-panelling, for furniture generally, and in the making of light packing-cases. It is white, soft, and easily worked, with a pleasant perfume, which makes its adoption for panelling or room furniture particularly desirable. As might be expected, the wood of this tree produced in Britain differs but little from foreign specimens, at least such was our verdict after an impartial examination.

A. D. Webster.

Penrhyn Castle, North Wales.

BOXWOOD AND ITS SUBSTITUTES.

BY JOHN R. JACKSON, A.L.S.,

CURATOR OF THE MUSEUM, ROYAL GARDENS, KEW.

(*Continued from p.* 623.)

Natural Order Sapindaceæ.

8. *Acer saccharinum,* L. (Sugar or Bird's-eye Maple).—A North American tree, forming extensive forests in Canada, New Brunswick, and Nova Scotia. The wood is well known as a cabinet or furniture wood. It has been tried for engraving, but it does not seem to have attracted much notice. Mr. Scott says it is sufficiently good, so far as the grain is concerned. From this it would seem not to promise favourably.

Natural Order Leguminoseæ.

9. *Brya ebenus,* A. DC.—A small tree of Jamaica, where the wood is known as green ebony, and is used for making various small articles. It is imported into this country under the name of cocus wood, and is used with us for making flutes and other wind instruments. Mr. Worthington Smith considers that the wood equals bad box for engraving purposes.

Natural Order Rosaceæ.

10. *Pyrus communis,* L. (Common Pear).—A tree, averaging from 20 to 40 feet high. Found in a wild state, and very

extensively cultivated as a fruit-tree. The wood is of a light-brown colour, and somewhat resembles limewood in grain. It is, however, harder and tougher. It is considered a good wood for carving, because it can be cut with or across the grain with equal facility. It stands well when well seasoned, and is used for engraved blocks for calico-printers, paper-stainers, and for various other purposes. Pear-wood has been tried for engraving purposes, but with no great success. Mr. Scott's opinion of its relative value is referred to under pai'cha wood (*Euonymus Sieboldianus*).

11. *Amelanchier canadensis*, L. (Shade Tree or Service Tree of America).—A shrub or small tree found throughout Canada, Newfoundland, and Virginia. Of this wood Porcher says, in his *Resources of the Southern Fields and Forests:* "Upon examining with a sharp instrument the specimens of various southern woods deposited in the museum of the Elliott Society. . . . I was struck with the singular weight, density, and fineness of this wood. I think I can confidently recommend it as one of the best to be experimented upon by the wood engraver."

12. *Cratægus oxyacantha*, L. (Hawthorn).—A well-known shrub or small tree in forests and hedges in this country. The wood is very dense and close grained. Of this wood Mr. Scott reports that it is by far the best wood after box that he has had the opportunity of testing.

Natural Order Myrtaceæ.

13. *Eugenia procera*, Poir.—A tree 20 to 30 feet high, native of Jamaica, Antigua, Martinique, and Santa Cruz. A badly seasoned sample of this wood was submitted to Mr. R. H. Keene, who reported that "it is suited for bold, solid newspaper work."

Natural Order Cornaceæ.

14. *Cornus florida*, L. (North American Dogwood).—A deciduous tree, about 30 feet high, common in the woods in various parts of North America. The wood is hard, heavy, and very fine grained. It is used in America for making the handles of light tools, as mallets, plane stocks, harrow teeth, cog-wheels, etc. It has also been used in America for engraving.

In a letter from Professor Sargent, Director of the Arnold Arboretum, Brooklyn, Massachusetts, he says: "I have been now for a long time examining our native woods, in the hope of finding something to take the place of boxwood for engraving, but so far, I am sorry to say, with no very brilliant success. The best work here is entirely done from boxwood, and some *Cornus florida* is used for less expensive engraving. This wood answers fairly well for coarse work, but it is a difficult wood to manage, splitting, or rather 'checking,' very badly in drying." This, however, he states in a later letter, "can be overcome by sawing the logs through the centre as soon as cut. It can be obtained in large quantities." Mr. R. H. Keene, the engraver before referred to, reports that the wood is very rough, and suitable for bold work.

Natural Order Ericaceæ.

15. *Rhododendron maximum*, L. (Mountain Laurel of North America).—Of this wood it is stated in Porcher's *Resources of the Southern Fields and Forests*, p. 419, that upon the authority of a well-known engraver at Nashville, Tennessee, the wood is equalled only by the best boxwood. This species of *Rhododendron* "abounds on every mountain from Mason and Dixon's line to North Georgia that has a rocky branch." Specimens of this wood submitted to Mr. Scott were so badly selected and seasoned, that it was almost impossible to give it a trial. In consideration of its hardness and apparent good qualities, further experiments should be made.

16. *Rhododendron californicum.*—Likewise a North American species; the wood is similar to the last-named. Specimens sent to Kew by Professor Sargent for report in 1882 were so badly seasoned, that no satisfactory opinion could be obtained regarding it.

17. *Kalmia latifolia*, L. (Calico Bush or Ivy Bush of North America).—The wood is hard and dense, and is much used in America for mechanical purposes. It has been recommended as a substitute for boxwood for engraving, and trials should therefore be made.

Natural Order Epacrideæ.

18. *Monotoca elliptica*, R. Br.—A tall shrub or tree 20 or 30 feet high, native of Queensland, New South Wales, Victoria, and Tasmania. The wood has been experimented upon in this country; and though to all appearances it is an excellent wood, yet Mr. Worthington Smith reported upon it as having a bad surface, and readily breaking away, so that the cuts require much retouching after engraving.

Natural Order Ebenaceæ.

19. *Diospyros texana.*—A North American tree, of the wood of which Professor Sargent speaks favourably. "It is, however," he says, "in Texas at least, rather small, scarcely 6 inches in diameter, and not very common. In Northern Mexico it is said to grow much larger, and could probably be obtained with some trouble in

sufficient quantities to become an article of commerce." Of this wood Mr. Scott says: "It is sufficiently good as regards the grain, but the specimen sent for trial was much too small for practical purposes." Mr. R. H. Keene, the engraver, says it "is nearly equal to the best box."

20. *Diospyros virginiana,* L. (the Persimmon of America).—A good-sized tree, widely diffused, and common in some districts. The wood is of a very dark colour, hard, and of a fairly close grain. It has been used in America for engraving, but, so far as I am aware, has not been tried in this country. It has, however, been lately introduced for making shuttles.

21. *Diospyros ebenum,* Kœnig (Ebony).—A wood so well known as to need no description. It has been tried for engraving by Mr. Worthington Smith, who considers it nearly as good as box.

Natural Order Apocyneæ.

22. *Hunteria zeylanica,* Gard.—A small tree, common in the warmer parts of Ceylon. This is a very hard and compact wood, and is used for engraving purposes in Ceylon, where it is said by residents to come nearer to box than any other wood known. On this wood Mr. Worthington Smith gave a very favourable opinion, but it is doubtful whether it would ever be brought from Ceylon in sufficient quantities to meet a demand.

Natural Order Bignoniaceæ.

23. *Tecoma pentaphylla,* Dl.—A moderate-sized tree, native of the West Indies and Brazil. The wood is compact, very fine, and even grained, and much resembles box in general appearance. Blocks for engraving have been prepared from it by Mr. R. J. Scott, who reported as follows:—"It is the only likely successor to box that I have yet seen, but it is not embraced as a deliverer should be, but its time may not be far off."

Natural Order Corylaceæ.

24. *Carpinus betulus,* L. (Hornbeam).—A tree from 20 to 70 feet high, with a trunk sometimes 10 feet in girth, indigenous in the southern counties of England. The wood is very tough, heavy, and close grained. It is largely used in France for handles for agricultural and mining implements, and of late years has been much used in this country for lasts. The wood of large growth is apt to become shaky, and it is consequently not used as a building wood. It is said to have been used as a substitute for box in engraving, but with what success does not appear.

25. *Ostrya virginica*, Willd. (Ironwood, or American Hornbeam).—A moderate-sized tree, widely spread over North America. The wood is light coloured, and extremely hard and heavy; hence the name of ironwood. It is used in America by turners, as well as for mill-cogs, etc., and has been suggested as a substitute for boxwood for engraving, though no actual trials, so far as I am aware, have been made with it.

Besides the foregoing woods, there are others that have been occasionally used for posters and the coarser kinds of engraving, such as lime, sycamore, yew, beech, and even pine; and in America, *Vaccinium arboreum* and *Azalea nudiflora*. Of these, however, but little is known as to their value.

It will be noticed that in those woods that have passed through the engraver's hands, some which promised best, so far as their texture or grain is concerned, have been tried upon very imperfect or badly seasoned samples.

The subject is of so much importance, as was pointed out at the commencement of this paper, that a thoroughly organized series of experiments should be undertaken upon carefully seasoned and properly prepared woods, not only of those in the preceding list, but also of any others that may suggest themselves as being suitable. It must always be borne in mind that the questions of price and the considerations of supply and demand must to a great extent regulate the adaptation of any particular wood.

With regard to those woods referred to as being tried by Mr. Worthington Smith, he remarks that any of them would be useful for some classes of work, if they could be imported, prepared, and sold for a farthing, or less than a halfpenny, per square inch. Specimens of all the woods here enumerated are in the Kew Museum.

By reference to our advertisement pages our readers will observe that the Scottish Arboricultural Society have now made up the list of subjects for their prize essays. We publish a summary of these subjects on another page of our present issue. Their variety and scope should call forth an overflowing competition, and we hope especially that assistant foresters, for whom *Class II.* in the list is exclusively provided, will be strongly induced to show their appreciation of the encouragement offered by a very general response to the invitation of the Council.

SPANISH CHESTNUT.*

ALTHOUGH I have too long omitted to notice the references to this wood, and to my published opinions about it, contained in your report of the discussion on Mr. Hems' paper on the Old Woodwork at Exeter, read before the Society of Architects in December last (see p. 884), I trust the interest which the subject possesses will justify my referring to it now.

Mr. Hems, to whom I have been much indebted for his correspondence with me on this subject, makes a mistake in saying that I "had boldly asserted that no chestnut was ever used in England, and that what was supposed to be chestnut was oak." What I have asserted for many years is that in every single case in which an old roof had been stated to be of chestnut, it turned out on examination to be of oak. This I still say; but if any one can bring forward an instance of its use in the construction of any old building, I shall very gladly accept it as a new discovery in archæology.

Mr. Hems did indeed send me a piece of the screen of Rodmersham Church, which I fully believe to be of Spanish chestnut, and I published the fact at the time. It is, so far as I know, the only instance of a piece of church fitting or other joiners' work in that wood older than about 200 years; but we may hope to find more of it by intelligent search. Many of the old "marriage coffers" or chests that are said to be of chestnut are of walnut, which is commonly used in Italy for joiners' work where we might use oak.

Mr. H. T. Bonner states in the same discussion that both oak and chestnut were used in Eltham Palace and Westminster Hall. An assertion of that sort made, I will venture to say, in the face of the strongest possible evidence to the contrary, and without the slightest foundation—so far as is publicly known—shows how persistently an error comes to the surface again, however often it may have been killed and buried. It would be easy for any one who really found a piece of chestnut in an old roof to give to others the same chance of examining it as he himself can have had, though he might not be able to send a specimen. I have heaps of specimens sent me from old roofs, every one of which is clearly oak. Until I wrote my paper on this subject for the R.I.B.A. in 1878, the museum at Kew Gardens contained a beautiful brown oak, labelled "Spanish Chestnut." However, the curator of that department actually attended at the Institute with the specimens, and spoke, fully agreeing that it was labelled by mistake, and that no chestnut in English mediæval carpentry was known to exist.

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* Contributed to the *Building News* of February 5.

This is not merely a question for antiquaries. I have shown clearly and often that this chestnut delusion is mischievous. Some ten years ago, a large timber bridge over the River Wye in Herefordshire had to be taken down after standing less than twenty years, owing to its having been built of Spanish chestnut, in the belief that that timber was equal in durability to oak.

THOS. BLASHILL.

SOCIETIES.

EDINBURGH BOTANICAL SOCIETY.

THE Botanical Society of Edinburgh met on Thursday, 11th February 1886, in 5 St. Andrew Square—Professor Dickson presiding. Mr. A. Galletly, Curator of the Edinburgh Museum of Science and Art, made a communication on "Some of the Properties of Rosewood." At the outset the paper gave an account of the introduction of Brazilian rosewood for furniture purposes, fully 200 years ago, and referred to its abundance and distribution in the provinces on the east side of Brazil. It also stated that, notwithstanding the importance of rosewood as a product of Brazil, the exports from that country being of the annual value of £100,000, and the length of time it has been used as a cabinetmaker's wood, the species of tree which yields the wood is not yet known. Some account of the nature of the wood was then given, such as its odour of roses when fresh; its hardness, durability, and beauty, and more particularly its highly resinous character. Then followed what it was the main object of the paper to illustrate, namely, the nature of the resins and resinous colouring matters extracted from the wood by naphtha, ether, and alcohol. These extracts, which amounted in most of the samples tried to about 20 per cent. of the wood, have a considerable resemblance to the pinewood resins, but, unlike them, the rosewood, alcohol, and ether extracts have a strong tinctorial power. A comparison was then made between the extracts of Brazilian rosewood and those of their supposed allies in East India, namely, the two dark heavy woods called the Sissoo and the East Indian rosewood or blackwood, both being species of *Dalbergia*. The result of a number of experiments showed that the resinous matters in those rosewoods closely resemble each other both in nature and quantity. It was also stated that some at least of the extracts of teak and greenheart differed very much from those of the rosewoods, while those obtained from mahogany bore a greater, though not at all a close, resemblance to rosewood. Mr. Robert Lindsay, Curator of the Royal Botanic Garden, submitted his report on the progress of vegetation during January. He said that at the Royal Botanic Garden last month had not been exceeded in severity by any month since December 1882. The first three days were mild and genial, but they were followed by a succession of severe frosts and snowstorms till the end of the month, unbroken, except by an occasional flash of lightning or a hailstorm. Several very low readings of the thermometer were registered, the lowest being on the 19th, when the glass fell to 8 deg., or 24 deg. of frost. This had not been exceeded since 15th December 1882, when 4 deg. more of frost were registered.

SCOTTISH HORTICULTURAL ASSOCIATION.

ON the 2nd February a meeting of this Association was held at 5 St. Andrew Square, Edinburgh. Mr. Milne presided. A paper on "The Ivy" was read by Mr. John Methven (of Messrs. Methven & Son), Vice-President. At the outset he gave a historical and poetical account of the ivy, in which he stated that in the earliest days of civilisation it acquired renown by its association with religious rites and social usages. Mr. Methven proceeded to give descriptions of the various kinds of ivy and their cultivation, and in this connection exhibited specimens of thirty-three different varieties. He next spoke of its usefulness as a town garden plant, referring specially to the bank of ivy in West Princes Street Gardens, Edinburgh. No other plant, he asserted, could be grown so effectively on that bank as the ivy, and Mr. M'Leod deserved credit for having adopted it for that purpose. He also pointed out the suitability of the plant for window culture. A discussion followed, after which Mr. Methven was awarded a vote of thanks for his paper.

The following interesting collection of early spring flowers from Easter Duddingston Lodge was exhibited:—*Garrya elliptica, Helleborus niger, H. n. angustifolius, Hepatica triloba, H. t. alba, H. t. rubra, H. angulosa, Galanthus plicatus, Eranthis hyemalis,* and *Erica herbacea alba.*

A new leek—a hybrid between the Musselburgh and Henry prize varieties—sent by Mr. Howie, of Inch House, Liberton, was also shown.

SCOTTISH ARBORICULTURAL SOCIETY.[*]

THE following subjects are offered for Prize Competition during 1885–86:—

CLASS I.—FOR OPEN COMPETITION.

I. *A Medal.*—For the best and most complete Original Plan, accompanied with Specifications and Estimate, for the erection of a Forester's Cottage.

> The author to give elevations and detailed sections, and also show the sanitary arrangements—ventilation, drainage, and water supply. The drawings, etc., to be the work of the author.

II. *Five Guineas* offered by Alex. Mackenzie, Esq., Superintendent, Epping Forest, Essex—For an approved Essay on the Comparative Value of the Coniferæ, as Ornamental or Timber Trees, in Britain, giving the date of introduction of Exotics, and results obtained.

III. *A Medal.*—For an approved Report on the Effects of the Great Gales of the last twenty-five years on the Woods and Forests of Britain.

IV. *A Medal.*—For the History and Details of Management of the Plantations on an Estate for a period of not less than twenty years.

V. *A Medal.*—For an Essay on Economic Forestry, giving the vernacular and botanical names, and native countries of different trees, with the uses to which the various parts of the plant are applied.

VI. *A Medal.*—For an approved Report on the Comparative Value of the different Timber Trees grown for profit in Britain, with rate of growth of each species in a given time.

VII. *Three Medals, one for each Country.*—For an approved Report on the Plantations of which the competitor is Forester. A Medal to be awarded for the best Report from England, Scotland, and Ireland, and competition to be confined to each country.

VIII. *A Medal.*—For an Essay on the Present State and Future Prospects of Arboriculture in the county in which competitor resides.

IX. *A Medal.*—For an approved Essay on the best system of Managing Oak Plantations and Oak Coppice.

X. *A Medal.*—For an approved Essay on the best method of Rearing Underwood for Game Coverts in High Forest.

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[*] As only a Summary is here given, competitors should obtain full particulars and conditions by writing to the Secretary.

XI. *A Medal.*—For an approved Report on Coniferæ, produced from home seed as compared with plants from foreign seed.

XII. *A Medal.*—For an approved Essay on the Natural Reproduction (by self-sowing) of Forest Trees.

XIII. *A Medal.*—For an approved Essay on the advantages of forming belts of Plantations on Hill Pasture Land.

XIV. *A Medal.*—For Essay or Report on an Arboretum, with plan.

XV. *A Medal.*—For an approved Report on the Old or Remarkable Trees on the Estate where the competitor resides.

XVI. *A Medal.*—For an approved Report on Timber grown in Scotland, and its Uses.

XVII. *A Medal.*—For an approved Essay on the best methods of Utilizing Small-wood in the manufacture of Fancy-wood Articles, Turnery, etc.

XVIII. *A Medal.*—For an approved Essay on the best methods of Seasoning different Timbers.

XIX. *A Medal.* — For an approved Essay on any Disease incidental to Forest Trees. A standing subject.

XX. *A Medal.*—For an approved Report (from personal knowledge) on the Forests of any British Colony.

XXI. *A Medal.*—For an approved Report (from personal knowledge) on the Forests of the United States of America.

XXII. *A Medal.*—For an approved Report on the system of Forest Management in any foreign country.

XXIII. *A Medal.*—For an approved Essay or Report on any other subject connected with Arboriculture.

XXIV. *A Medal.*—For a New Invention, or a marked improvement on any of the Implements used in Forestry. (Models or implements to be accompanied by a Report.)

CLASS II.—FOR ASSISTANT FORESTERS ONLY.

I. *A Medal.*—For an approved Essay on the Formation of Plantations.

II. *A Medal.*—For an approved Essay or Report on the best method of Renovating Overgrown Shrubberies.

III. *A Medal.*—For an approved Report on the Management of a Home Nursery.

IV. *A Medal.*—For an approved Essay on the best Size of Plants, and method of Planting to produce the best results in different soils and situations.

V. *A Medal.*—For an approved Essay on the best Dead Fence (iron, wire, wood, or stone), taking into consideration economy, efficiency, and durability; and detailing the method of erection and cost.

VI. *A Medal.*—For an approved Essay on the Peeling and Harvesting of different kinds of British Bark used in Tanning.

VII. *A Medal.*—For an approved Essay on the best method of keeping Foresters' Tools in order.

VIII. *A Medal.*—For the best and approved Model in Rustic Work, or in Ornamental Woodwork, of any subject designed and executed by the competitor. Model not to exceed six feet in length.

IX. *A Medal.*—For an approved Essay or Report on any other subject connected with Arboriculture.

FOREST WORK FOR THE MONTH.

ENGLAND.

MARCH often approaches us in a boisterous manner, and not unfrequently maintains its stormy character throughout. Should the air currents approach us from the north and east, they will be keen, dry, and strongly evaporative; but if from the opposite quarter, we may expect mildness, with probably an overplus of moisture.

ORCHARD.—All fruit-tree planting should be finished by the beginning of this month, and pruning should be confined to small branches and shoots. Where grafting is a necessity, begin with plums, and then follow with cherries, pears, and apples.

FENCES.—Hedge planting should be finished early. From the mildness of the winter, at least in the south of England, we may expect an early appearance of vitality in vegetation, upon the approach of which thorn planting should cease for a season. Newly-planted thorn or other hedges should be protected from stock for a few years, by some sort of fence, until the plants become sufficiently strong to be a fence themselves. A very economical fence may be constructed with wire strained upon wooden posts, on one or both sides of the hedge, as necessity demands. If the top wire is barbed, the fence will be most effective, and the under wires may be of a light gauge, with one strong wire at the height at which sheep would rub themselves. Finish planting and laying old hedges, and dig under and clean young hedges.

PLANTING in the forest should be completed by the beginning of this month. If it be continued beyond the middle, and dry weather should set in, the probability is that the operations will prove partially abortive.

THINNING should also terminate early, as the trees become very sensitive to cold currents of air suddenly set into circulation amongst them; and the early appearance of epicormic branches upon their stems indicates the injury they have sustained from their late and rapid exposure. Whenever epicormic branches develop themselves, they should be repeatedly dressed off, until they cease to grow at all. Their unchecked development often causes premature maturity in the tree, and materially depreciates the quality and value of the timber. A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

IT is desirable to have all timber and wood of every description cut off the root by the end of the present month. It is of small importance at what season timber is cut as affects the duramen or heartwood of the tree, but it is otherwise in regard to young trees and sapwood, which should always be cut when the sap is dormant, or at least nearest to it, for it is doubtful if it is ever perfectly at rest.

The sapwood of oak cut in winter, and used with the bark on, has been known to last two and sometimes three times longer than it does when peeled. The bark, however, being itself a strong protection against decay, may to some extent at least account for the difference of duration of the wood.

Holly for whip handles, walking-sticks, and other purposes where shrinkage of the bark is detrimental, and underwood of all kinds, osier or basket willows, should all be cut before the sap begins to expand the bark.

Planting where not finished should be prosecuted with all diligence, for it should be borne in mind that every day's delay entails so much additional risk of failure, and renders general success less certain. Spring planting, however, though less certain of success than that of autumn, is yet not altogether without its compensating benefits, for while many plants planted in autumn are eaten by rabbits, spring planted ones often escape.

Nursery work of all kinds now require the closest attention; grafting, lifting, planting, digging, preparing ground for seed, sowing, etc., all require to be done without delay.

Hedges should be gone over with suitable plants, and all blanks and failures made good. Pruning, too, where not completed, should be so, and if at any time this department falls behind, additional hands should rather be employed than allow the work to be done hurriedly, which means imperfectly—a thing to be carefully avoided in everything connected with hedges, especially those on roadsides, which are there quite as much for ornament as use.

Fences generally, again in spring, as in autumn, require to be gone over, and properly repaired, for, as is well known, a weak and comparatively poor fence will do so long as the animals against them have not learned the practice of forcing through, while if once they have found their way into the plantation, it requires an extra strong fence to prevent them repeating it.

All blown, broken, and decaying trees, and also all unsightly broken branches within sight of the walks, drives, and roads, should be removed to their proper destination for other reasons besides economy.

Drains, which always suffer more or less from winter rains and floods, require to be gone over, and cleared of all accumulation of leaves, branches, and other obstructions; and all close drains, culverts, and branches should have proper attention paid to them.

Roads require very careful and close attention at all seasons, but at no time more so than now. Filling tracks, levelling, and rolling are works to be done at once, especially on unmetalled drives and rides, where clay abounds.

The squirrel, which still lingers amongst the larch cones, should be closely watched, and no opportunity of killing him be allowed to escape. Different estates have different systems of killing and keeping down this most destructive little creature; ours is to pay the gamekeepers 6d. each for all the tails they bring in. On some estates where very numerous, 3d. each is sufficient to begin with, and raise the premium as they grow scarcer.

C. Y. MICHIE.

CULLEN HOUSE, 18*th February* 1886.

LETTERS TO THE EDITOR.

A REMARKABLE TREE—SYCAMORE OR PLANE.

SIR,—In the last issue of *Forestry* I observed notice taken of the above tree, which was cut recently on the estate of Woodend, Madderty, and is said to be by far the finest of the kind in Perthshire. The bole measured 30 feet to the branch, and the full length of the trunk was 38 feet. It had a girth of 9 feet measured 5 feet from the ground, and its average circumference was 8½ feet. It contained about 164 cubic feet.

The above certainly was a very fine tree, but I beg to inform your readers who are interested in trees that there is one of the same kind in Perthshire about double the size of the Madderty one. When Lord Mansfield acquired the estate of Logiealmond in 1842, I measured the largest of a number of sycamore trees in Logie Den, which then contained 309 cubic feet.

Last week the bole was measured, and found to be 20 feet to the first branch; circumference at 5 feet from the ground, 12 feet 5 inches; average girth, 12 feet 3 inches. The bole contains 180 cubic feet; and the top above 20 feet measures about 160 cubic feet of good sound timber;—in all, the tree contains about 340 cubic feet of timber. WILLIAM M'CORQUODALE.

JEANIE BANK, PERTH, 19*th February* 1886.

MECHANISM OF A TREE.

THE description of the mechanism of a tree may to some extent explain its growth, but the analogies about the roots (as human mouths and leaves as lungs) are too much strained to be of much practical service to the forester, or even the scholar, who is often obliged to accept his information from the pages of a book instead of from the leaves of nature.

The writer on this subject in the February number, says: "So in a tree, the nourishment taken in at these tree mouths, the roots, passes to the lungs (the leaves) of the tree, and there, by contact with the air, is rendered fit to supply fresh material to the tree." This description may fairly represent the mechanism of tree growth in its normal state, but for practical commercial forestry we know trees grow and thrive though deprived of their leaves, and in arid soils live without the superflux of moisture from the roots to which the writer in a previous part of his paper refers. The tea plants live though denuded of their leaves. When a tree is cut down, and shoots are sent up from the old root or bole, there are no leaves or lungs to these shoots till they are some inches or even feet high, as in the case of willows and osiers.

For growing timber in great lengths for commercial purposes, all lateral shoots are kept trimmed off, only the leading or top growth is left.

Many fine old trees in the ancestral parks of Britain were pollarded on the Abbey and Nunnery lands to prevent the Commissioners of Henry VIII. marking them as serviceable for the navy. They exist to-day to prove that tree growth can be maintained irrespective of leaf or lung sustenance for a season. J. CHARLES KING.

BULSTRODE, BUCKS.

The analogy alluded to between the roots and leaves of a plant and the mouth and lungs of an animal respectively, is not in any degree strained, but rather is, in so far as the differences of organic structure that exist between those two forms of life will admit, perfect. That "tea plants will live without leaves" for a time is true (so also will plants generally), but that they will do so for long or indefinitely is an error borne out by everyday experience. Responsive action between the leaves and the roots must be sustained, else there can be no living and thriving for any length of time in any plant. The herbaceous condition of the shoots that spring from the roots of recently felled trees enable them to fulfil the functions of leaves for a time, till leaves are put forth, and prove that nature is not without resource when by accident or design disturbance of the balance of functional action takes place. "Practical commercial forestry" cannot possibly be benefited by the argument that trees may be denuded of their leaves or planted in "arid soils" and yet "grow and thrive."—Ed.

PRUNING.

SIR,—If it be correct that nature is all-sufficient to prosecute to completion the whole course of tree existence, without any sort of human aid or direction, it must be apparent to all that proprietors who have heretofore kept foresters and woodmen to look after the prosperity and progress of their woods might have abandoned the woods to the administration of nature, and cashiered those sinecure officials. Or if proprietors believe that their woods and plantations will thrive better left to the care of nature, certainly these are times in which retrenchment in any shape or department is not to be cast to the wind. Rather than neglect a means of economy foresters ought to be cast adrift.

This question of pruning is a question of infinite vitality in the advancement and evolution of progressive forestry. It touches a vital action in the system of forest management, and it cannot be negatived by an audacious No. The pruning of trees is like their thinning, never well done when intrusted to ignorance.

Time, the chief factor in pruning as in every other operation of judicious tree-culture, is not considered an essential element of success by the advocates of nature. And yet these would-be disciples of nature only copy her in part. Now it is in the time of doing the work, not only in regard to the best season, but also as to the period of life, that the success or failure of the operation depends. The pruning of trees (of deciduous hardwood trees such as oak, etc.) cannot be commenced too early, but may be begun too late, the more so if they never have experienced any prior operation.

The man who truncates large limbs, leaving wounds on the trunk twenty or thirty inches in size, must have very little knowledge of and sympathy with the subject brought under the power of such cruel treatment. Yes, but what are the causes that have co-operated to produce these huge limbs? It would be interesting to know how these trees come to have such huge limbs? Are they due to pruning or to the want of pruning?

If nature was to be the model on which we choose to base our line of procedure, we must observe how close she plants, and how severely she prunes during the primordial years of tree growth. The process of pruning is not less severe in the natural forests than the process of thinning; but whether either of these operations is so well and equally done as when done by the operation of man is one of those technical points in forestry not yet settled.

In trying to comprehend the limit of nature's capacity, it should always be kept in view that all soils (the poorest and the richest) have a maximum of yield, beyond which they will not produce. And trusting the matter to nature, does nature distribute her greatest product to the best advantage over any area? or does man apportion it to greater advantage?

We are not without plenty of examples, in every part of this Britain, where the woods have been altogether abandoned to the absolute immunity of nature, but with what result? What is the meaning of this plantation and that plantation all run to branches, if pruning be an evil? Or what is the meaning of this other and that other plantation of moribund, hide-bound, dead, deformed, and attenuated trees, unable to support the burden of their own weakness, if thinning be an evil? These are questions we never see satisfactorily answered. The fact is, this method of leaving our woods and forests to the control of nature has been too long and too much in practice to further prolong or encourage the experiment.

Captain Rogers remarks that "we get our finest timber, freest from knots, from unpruned forests." That is not so, however, in regard to our home-grown timber. And the foreign timber imported into this country is produced entirely under different conditions, both as to soil, climate, and planting. For one tree we plant on a yard of ground, nature in the natural forest perchance plants a thousand. We plant at specified distances. Nature plants and stocks the ground to the fullest extent. There is no space in the forests of nature to grow strong branches, and for this reason there is no necessity for artificial pruning. Until we are prepared to imitate nature in all her ways, we shall have to be contented to pursue the most rational way of producing the most useful and most valuable timber. There is a vast destruction of tree-life in the forests of nature; but that is not relevant to the matter under discussion, and is only alluded to here by the way.

Captain Rogers says: "A wound twenty inches would take more than twenty years to be covered over with new wood." Now if the work of pruning has been properly attended to from the beginning, there should be no branches so large as that named to cut off when the tree is old. This brings out once more very clearly that the work of pruning, to be well done, must be begun early. The force of vitality is in full flow when the tree is young, and wounds made on the trunk by branch amputation are soon healed—in fact, scarcely felt by the tree, and leave no depreciative blemish in the body of the timber.

But rather than have our forests thinned and pruned in the barbarous fashion they are sometimes done, nature's treatment might be preferable. Captain Rogers says, I do not "distinguish between death and decay." That was a very nice distinction to make; but, without being ambiloquous, the subjoined definition may suffice. Decay is anterior and posterior of death. Death is an advanced stage of decay, but not the last.

Although I am not able to agree with Captain Rogers on this question of pruning, it is nevertheless most gratifying to find a gentleman of his position and ability not above discussing practical matters in whatever way related to this highly important branch of rural economy.

At the same time, I hope "Count de Cars' book" on pruning will be very widely read by every one directly or indirectly interested in the progress of forestry; not because they will not find some ground of dissent with the theories therein propounded, but because it is a valuable treatise on the scientific manipulation of a branch of practical forestry comprehensively demonstrated.—I am, yours faithfully, JAS. FARQUHARSON.

GLENDYE, *February* 22, 1886.

APPOINTMENT.

LORD IDDESLEIGH has selected Mr. D. Morris, Director of the Public Gardens, Jamaica, for the appointment of Assistant Director of the Royal Botanic Gardens at Kew.

LEGAL.

RATING OF FOREST LANDS.

DELAY AND EXPENSE OF THE LAW.

AT a recent meeting of the Bromyard Board of Guardians, the Assessment Committee reported upon proceedings in connection with Mr. J. H. Barneby Lutley's appeals against the poor rates in respect of his woodlands for the parishes of Linton, Lower Brockhampton, Norton-with-Brockhampton, and Whitbourne. The first appeal was heard before the Bromyard Petty Sessions, on the 19th January 1885,* when the assessment on upwards of 410 acres of land belonging to Mr. Lutley was reduced from £150, 1s. 6d. gross to £57, 14s. 3d., being an average gross rental of 2s. 10d. per acre. The Assessment Committee decided to appeal to the Herefordshire Quarter Sessions; but the chairman, Sir R. Harington, advised that the consent of the Guardians was necessary, and on a division the numbers for and against were equal. The Assessment Committee laid the case before Mr. A. T. Lawrence, who advised that the Committee had power to appeal to Quarter Sessions without consent of the Guardians. On 19th March the Committee applied to the Guardians for consent to proceed in their appeal, but were refused by 12 votes to 10. The majority included Mr. Lutley and his steward, Mr. Wyndham. In consequence of this decision, the Committee abandoned the appeal, and in May 1885 directed that a new valuation should be made on the whole of the woods in question. On the 23rd September Mr. Lutley gave notice of appeal to Quarter Sessions against the new valuation in respect of 418 acres 29 poles of woodland, assessed at £154, 10s. The appeal was respited from the October to the January Quarter Sessions. The Committee meanwhile consulted valuers, but owing to circumstances were advised to ask for further respite of the appeal. The application was made, but refused; and the appeals were heard and decided upon the evidence of the appellant's witnesses alone. The Court reduced the assessment of the 418 acres from £154, 10s. to £79, 16s. 6d., being an average of about 3s. 9¾d. per acre. The Committee were ordered to pay the appellant's costs, which, after taxation, amounted to £91, 19s. 8d., while their own were estimated at about £160. The Committee gave a schedule of the assessments that had been made, which they said showed that the assessment of 410 acres at £57, 14s. 9d. gross made by the Bromyard Special

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* Reported in *Forestry* for March 1885.

Sessions, when the Committee defended the appeals and produced evidence supporting their assessment, was raised to £75, 14s. 6d. by the Court of Quarter Sessions, when the Committee did not defend the case or produce evidence. The Committee further remarked that part of the land assessed by the Quarter Sessions at 5s. an acre was tithe free, and was now bearing a crop of larch of 18 or 20 years' growth, estimated to be worth £40 to £60 an acre. Other parts of the land were ornamental belting to Brockhampton Park. A part of the land assessed at 4s. an acre was also tithe free, and was ornamental plantation and pleasure-ground near to the mansion. Other parts were open park-like land. Hodgbatch coppice, assessed at 3s. an acre, was within a mile of Bromyard, and was surrounded by land rated at over £1 an acre. Mr. Lutley did not appear to be assessed for 50 or 60 acres of land in the parish of Norton. The classification of the Brockhampton estate, as supplied by Mr. Lutley and adopted by the Committee, on the motion of Sir R. Harington, appeared to be incorrect. There appeared to be a larger quantity of ashbed than was accounted for to the Committee. The value put by the Court of Quarter Sessions upon Mr. Lutley's woods and lands was, in the Committee's opinion, too low. They therefore recommended, in order to place the land upon a proper footing, and to assure that Mr. Lutley should be fairly rated in comparison with other ratepayers in the Union, that all his lands and woods in the parishes appealed against should be scheduled and valued by competent and independent persons.

Mr. Trinder, as chairman of the Assessment Committee, moved the adoption of the report. He was sorry they could not go to a court of justice without incurring such an enormous expense. It would be a good thing if they could import a little cheap law as well as other things. If the standard of value set up by the decisions of the magistrates were adopted throughout the whole Union, he did not know how the rates would be paid. The sum of 3s. 9d. an acre was not the value of land for the protection of game alone. The decision had caused a feeling of injustice in the minds of ratepayers who were paying upon a much higher value for similar land. The only way to solve the difficulty would be to call in an independent valuer.

Mr. Millyard seconded. As a practical man, getting his living by his knowledge of the value of land, he contended that Mr. Lutley's land was rated ridiculously low. The land should be rated at what it was worth to let from year to year; and if the land in question was in the market, he would undertake to find a tenant for it at a higher price than that put upon it by the Committee. The woods in the Union were rated at an average of 14s. an acre. If

3s. or 4s. an acre was the value of the virgin soil of Herefordshire, the rates at present were abnormally high.

After some discussion, Mr. Trinder offered to withdraw that portion of the report which suggested another valuation. The Chairman then withdrew his amendment, and the report passed.

REVIEWS OF BOOKS.

Canadian Forests, Forest Trees, Timber and Forest Products. By H. B. SMALL. Montreal: Dawson Brothers.

JUDGED merely by its size this must be called a small book, but a perusal of its pages reveals that it is a very full one. While it only cursorily deals with the vast subject of which it treats, the concise style of the author, and the compact, well-arranged plan of the work, render it a model of fulness and clearness of information. There can be no doubt but that the forests of Canada have played a most important part in the rapid development of the wealth and history of the country. We learn from statistics quoted in this little work, from the Census Returns for the Dominion of 1881, that there were then "thirty-four industries or occupations which depended in whole or in part upon wood or timber as their raw material for manufacture, and that there were in connection with these 17,577 establishments, employing 95,741 hands, turning out manufactured articles valued at 95,029,828 dols." This is exclusive of many industries in which timber, while not forming the raw material, is yet indispensable in their development. Speaking of the collateral benefits of the timber trade to the country as apart from those directly arising from exports, etc., the author says: "The lumbermen, moreover, create a home demand for farm products, generally at better prices than could be obtained elsewhere. To give an idea of the large consumption of agricultural produce in this business, the following statement of the requirements of one large firm in the Ottawa district for one season answers for all others in its general outline. This firm consumes 750 tons of hay, 25,000 bushels of oats, 5000 bushels of turnips, 6000 bushels of potatoes, 1000 barrels of pork, 9000 barrels of flour, 2000 barrels of oatmeal in the woods alone, or in round figures 2400 tons of agricultural produce are required by this one firm." It appears there are 83,000 men employed in the lumbering trade, apart altogether from other industries which depend on the forest products, who with their families must form a very large population.

The various forest districts are enumerated, and computations of the area occupied by forests in each, along with lists of the various trees, containing their ordinary and scientific names, are given, which are interesting as far as they go to the scientific as data regarding the distribution of the different species, and must be of considerable value to those engaged in the lumbering trade. An interesting chapter is devoted to an account of "Canadian Trees and their Woods," in which the species are enumerated and the wood each described and its uses indicated, and in most instances other products as far as they are utilizable are also described. There is also a short chapter devoted to the consideration of the minor products of the forest exclusively, but we should think this would bear extending considerably in point of the variety of those treated upon.

The Scottish Geographical Magazine. Edinburgh: Scottish Geographical Society.

THE February number of this Magazine is one of unusual fulness and interest to more than the ordinary class of readers. A paper on East Central Africa and its Commercial Outlook, by Joseph Thomson, F.R.G.S., deals most uncompromisingly with the numerous fallacies that have been recently set up respecting the countries and states of equatorial Africa, to induce confiding capitalists to invest in projects for the development of African trade; he corrects false but commonly-entertained views regarding the extreme fertility and salubrity of many districts of East Africa, and draws the general conclusion that the physical and climatic difficulties, and the inborn indolence, low intelligence, and hostility of the races, render the development of commerce and civilisation in East Central Africa a problem involving long-continued effort and precarious and remote results.

The paper on "The Ancient Civilisation, Trade, and Commerce of East Africa," exhibits great research on the part of the author, and abounds in facts of the greatest interest on the character of trade, and the modes of conducting it in Eastern Africa, and the countries around it, more than 2000 years ago.

Considerable interest will naturally at the present time centre in the paper by Holt S. Hallett, C.E., F.R.G.S., on the "Exploration Survey for a Railway Connection between India, Siam, and China." Our recent annexation of Upper Burmah renders the opening up of the populous regions lying between our older Indian possessions and China now practicable; and no doubt there will be a rapid development of trade in consequence. Much interesting information is given regarding the countries, their inhabitants, and their natural products. The peoples appear to be keenly intent on trade, but are greatly hampered by the difficulties and costs that attend the transport of goods, which is accomplished by means of caravans. There is an excellent coloured map of the region dealt with in the paper attached to the number.

The remainder of the number is well filled with the report of the "Proceedings of the Society," "Geographical Notes," and "Reviews."

A VERY seasonable circular on the subject of the *Afforestation of Waste Lands,* which is being distributed by Messrs. Little & Ballantyne, nurserymen, Carlisle, has reached us. It is addressed to land proprietors, and is full of practical and convincing facts and suggestions on the subject of planting uncultivated lands. The somewhat unreasoning apprehensions of landowners in view of possible changes in the laws relating to land should not influence them to stay their hand from effecting improvements, the results of which cannot in any way be affected by any possible legislation in the future. Whatever the nature of impending changes in that direction may be, it is certain that a just regard for the rights of proprietors to the possession of the land, and the fruits of capital invested in permanent improvements therein, will be fully recognised in their construction. The depressed state of agriculture and consequent superabundance of labour, and the unusually low price of nursery stock which prevail at the present time, offer exceptionally favourable circumstances under which to prosecute such improvements. The results of planting up the hundreds of thousands of waste lands that exist in every county in the United Kingdom, would be the amelioration of the climate by the creation of shelter, which would render agricultural lands adjoining the woods more valuable as well for stock as for crops; the increased shelter and pasturage for game would greatly enhance the value of property from the sportsman's point of view; and the most important and most direct result would be the yearly increasing value of the crop of timber on lands which are worthless for any purpose except timber growing, thus adding greatly to the wealth of the nation as well as the individual. Provided the selection of trees is rightly made in the first instance, that is, that trees well adapted to the soil and situation only are planted, and are well managed afterwards, it can be shown that enormous profits can be realized from otherwise worthless land. Such is the tenor of this circular, and, considering the vast importance of the subject from the national as well as from the individual point of view, we hope this address of Messrs. Little & Ballantyne, to the landowners of the whole country, will not be made in vain.

GOVERNMENT OF INDIA.

Code of Instructions for the Conduct of Office Business, and for the Regulation of Accounts in the Forest Department; with Forms. Third Edition. Calcutta: Superintendent of Government Printing, India.

This is a very voluminous but very necessary publication for the guidance of every grade of forest officer in the attainment both of a correct knowledge of his duties and of the mode of performance of the same. The system is necessarily one of elaborate detail, too much so for us to give any accurate idea of it in the space at our disposal. But the fullest information is given in regard to the organization of the Forest Department. It defines the titles of officers of every grade, along with the duties each has to perform, and gives the salaries of each. The terms and conditions of promotion are also stated, and the rules of admission to the service, along with the subjects on which the various grades of officers are examined prior to admission. Any one desirous of entering the service of the Indian Forest Department will obtain a very clear view of the nature of work he will have to perform, and the preparatory studies that should engage his attention, from a perusal of this book. He will also see from an examination of the list of salaries given below, that there is ample scope for ability and ambition to attain to high position and very liberal emolument. The following list of offices, with the salaries of each, is as given in the Code, beginning with the highest and descending by each successive grade to the lowest of the executive officers:—

Inspector-General,* . .	£170 to £200	per month.
Conservator, . .	£100 to £150	„
Deputy Conservator, .	£55 to £90	„
Assistant Conservator, .	£25 to £45	„
Sub-Assistant Conservator,	£15 and upwards	„
Forest Rangers, . .	£5 to £12	„

The forms illustrating the classification of accounts are remarkably simple and clear.

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* These sums are calculated on the basis of the rupee being worth two shillings, but as it is at present much less than this sum, the salaries as given above must of course be proportionately less.

OBITUARY.

THE LATE MR. DAVID DOIG, INCHTURE.

WE regret to record the death of this noted and cultured gardener, which took place at his house, Rossie Priory Gardens, Inchture, on 15th February. Last spring he was seized with paralysis, and in the summer was released from active duty, but took a keen interest in the work of the gardens until quite recently. On 15th February he was seized with a second attack, which shortly after proved fatal. He was born at Rukinch, parish of Meigle, in 1821, and served his apprenticeship as a gardener under Mr. James Kidd, who was fifty years gardener at Rossie Priory. He at same time studied botany, and became proficient in that science. He was in the employment of several gentlemen, and twenty years ago, when Mr. Kidd retired, was appointed head gardener at Rossie Priory, where his services were greatly appreciated. As a judge at horticultural exhibitions his services were greatly in request all over the country. He contributed articles to various horticultural and botanical newspapers and periodicals. He leaves a widow, but had no family, and will be greatly missed in horticultural circles.

WOOD SALES.

THERE were sold by public roup on February 3rd about 160 lots of wood on the estate of Lauriston, Kincardineshire. The wood consisted of Scotch and spruce fir suitable for stackyard purposes. Lots sold at from 2s. 7d. to 7s. The principal purchasers were Messrs. M'Rae, Milton; Lamb, Smiddyhill; Adams, Sullo; and Glen, Elsinore.

LEITH TIMBER TRADE.—With fine open weather at beginning of last month more was doing from the yards, but prices continued much the same. At Mr. D. W. Beattie's public sale on 16th February there was a large and varied assortment of Baltic wood goods offered, including the entire cargo of white deals and battens just landed *ex Skane*, s., from Hommelvih. Owing to the unfavourable weather, the attendance of buyers was not so large as usual, and the quantity disposed of was consequently restricted, although fair prices were got for what was sold.

CURRENT PRICES IN LONDON MARKET.

Timber and Hewn Wood.—Dantzic and Memel fir, per load, 30s. to 80s.; pitch pine timber, 50s. to 65s.; Canada red pine, 45s. to 75s.; Canada yellow pine, large, 55s. to 100s., small, 45s. to 70s.; Quebec oak, 100s. to 140s.; Baltic oak, 45s. to 100s.; Indian teak, 200s. to 310s.; wainscot logs (18 feet cubes), 60s. to 75s.

Deals; Sawn and Prepared Wood.—Norway, Petersburg stnd., £4 to £7, 15s; Swedish, £10 to £16; common, £5 to £8, 10s.; Russian, £6 to £17; Finland, £5, 10s. to £8, 10s.; Canada, 1st pine, £17 to £30, do. 2nd, £12 to £17, 10s., do. 3rd, £6, 10s. to £10, 15s.; American spruce, £6, 10s. to £10, 10s.; pitch pine planks, £9, 10s. to £12, 10s.; Dantzic deck, 40 feet 3 inches, 15s. to 24s.

MISCELLANEOUS.

The reason why all leaves have not the same shade is because the structure of the membranes varies in the several plants, as does the degree of oxygenation or acidification which has been produced on their constituent substances, and this variety is no less remarkable than constant in different species. The poet Cowper has ably drawn these characteristics in one of his poems, as follows:—

> "No tree in all the grove but has its charms,
> Though each its peculiar hue; paler some,
> And of a warmish grey; the willow such,
> And poplar, that with silver lines his leaf,
> And ash, far stretching his umbrageous arm:
> Of deeper green the elm, and deeper still,
> Lord of the woods, the long-surviving oak,
> Some glossy-leav'd, and shining in the sun,
> The maple, and the beech of oily nuts
> Prolific, and the lime at dewy eve
> Diffusing odours; not unnoted pass
> The sycamore, capricious in attire,
> Now green, now tawny, and ere autumn yet
> Have changed the woods, in scarlet honours bright."

Manufacture of Paper from Wood.—The idea of utilizing wood for the manufacture of paper was first suggested to Reaumur in 1719, from his noticing that the fabric of wasps' nests was formed out of wood reduced to a pulp. This industry has of late years acquired great importance, and is rapidly increasing, as the supply of rags, on which paper-makers formerly depended for their stock, is inadequate to the demand for the manufactured material. Were it not for this factor in paper-making, paper would now be one-half as much more, if not double, the price it is to-day. The woods most suitable for pulp-making are spruce, balsam, poplar, and basswood (lime), the two former being more refractory to reduce than the latter. Birch and beech are also used, but not nearly to such an extent as the other woods mentioned. There are two processes by which wood fibre is reduced to pulp, the mechanical and the chemical. The mechanical process consists in grinding the wood, which is cut into pieces about twelve inches long by four inches square, and placed in small boxes on a machine, where, by means of screws and hydraulic pressure, the wood is kept against the edge of a broad grinding-stone rapidly revolving. Water is supplied freely to facilitate the grinding and to wash away the pulp into receiving vessels, whence it is taken to be dried, and, if necessary, bleached. The same work is accomplished also by grinding with emery wheels. After the wood pulp leaves the grindstone, it is manipulated so as to get rid of the coarse fibres of wood or slivers that may be in it. After which it is run over what is called in the trade a "wet machine" into thick sheets, which are then bundled up and shipped to the paper-makers. The chemical process requires a large investment of capital and great skill and experience to make a good article. The wood is cut into chips diagonally about three-eighths of an inch thick, thus preserving the fibre. These are placed in a boiler with strong caustic liquor, closed tightly, and boiled, according to the wood used, at a pressure of from 90 to 120 lbs. of steam, for from eight to twelve hours. When properly cooked, the steam is blown off, and the boiler emptied into a drainer with a perforated bottom, which allows the liquor to run into the tanks below, after which the pulp is carefully washed, to carry off all trace of alkali; and the liquor, after being passed through a "recovery furnace," leaves a black soda ash which is as good as new for working again. The paper-maker mixes the wood pulp with rag pulp in a proportion of 40 to 60 per cent., according to the standard and quality of papers required.

Utilization of Waste Wood.—In the course of a lecture on forestry, recently delivered at Coniston, Mr. J. Robinson remarked that the Exhibition of Forestry in Edinburgh in 1884 brought to light an industry which was hardly known in England, except by its results, and that was the manufacture of paper pulp from the thinnings, etc. of trees. No less than fourteen of such manufacturers were grouped side by side at that Exhibition, and yet, so little does one part of the world know about the doings of the other part of it, that each of those pulp makers had till then apparently cherished the notion that paper pulp making from wood was an industry that was peculiarly his own; and some of these Continental pulp makers sent to England from sixty to eighty tons of pulp weekly, to be used in the printing of daily and other papers. Here was an industry hitherto confined to the Continent, and yet, why need those foreign manufacturers be allowed thus to monopolize an industry for which we had such abundant facilities at home? The thinnings of Scotch firs and spruces, six inches in diameter, were the wood most suitable for being reduced to pulp of this kind; at present much of this wood was used only for the fire, or allowed to rot, as perfectly useless, and yet with enterprise and capital it might be rendered quite as valuable as the paper pulp imported from abroad. Again, there was much wood required as prop wood for mines, and this could be supplied by the thinnings of the Scotch fir, which in five years required thinning again. Then there was match-making. Matches were a most important and essential item of our trade; and yet, notwithstanding all our facilities for growing the alder tree and other wood suitable for the manufacture of matches, we imported from Sweden and other northern countries most of the matches we use.

DISCOVERY OF TOWNS AND DENSE FORESTS IN WEST AFRICA.—The *Dresden Times* of February 16th publishes a letter from the African traveller Herr Schwarz, who was called last autumn to a post in the German Foreign Office. The letter, which is dated on board ship off Goree, Senegambia, January 27th, gives an account of Herr Schwarz's travels in the inland districts of the Cameroons. The writer says that he followed the great caravan route to the Calabar River, and after reaching Bakandu, on the confines of territory already explored, he continued his journey eastward into a region of which all hitherto existing maps are untrustworthy, and which is rigorously guarded by jealous tribes. Pursuing his way through far-reaching primeval forests, rich in gum trees and wild coffee, and teeming with elephants, Herr Schwarz, crossing the Kumba River, reached the territory of Bason, which he found studded with densely populated towns. This district, from which the people dwelling on the coast obtain ivory, oil, and slaves, is a very picturesque and comparatively well-cultivated plateau. The inhabitants, called Bafaraini, who are engaged in agriculture and cattle-rearing, have, up to the present, not even been known by name. Herr Schwarz's further advance was arrested in the vicinity of the Upper Calabar by a party of five hundred armed negroes, in consequence of which the African traveller returned to the coast by the Mungo River, the voyage, which was made in canoes, occupying several days.

CHIPS.

Sycamore, that has been useful simply for cigar boxes, comes into fashion for an inside house finish in place of cherry, ash, maple, and walnut, and good quarter-cut boards are worth £10 a thousand.

The art of sculpture in wood seems to have been native among the early Greeks, carved idols soon appearing as substitutes for those stones and trunks of trees which were at first worshipped as divine symbols. These were frequently so old that no account could be given of their origin, and they were consequently said to have fallen from the skies.

Respecting Male and Female Plants.—Prof. Hoffmann (in *Botanische Zeitung*) says that the proportion of male plants to female plants in the case of diœcious plants, such as willows, hops, etc., depends on the closeness with which the seeds are sown. When the seeds are sown very closely together, the proportion of male to female plants is 283 males to 700 females; while, when the seeds are sown at wider distances apart, there are only 76 males.

Thuja Gigantea.—This truly gigantic tree abounds along the coast of British Columbia and on the lower parts of the rivers of the coast range. It disappears in the dry central plateau, but re-appears in the slopes of the Selkirk and Gold ranges, on Shuswap Lake, and in the North Thompson Valley. On the coast it not unfrequently exceeds 15 feet diameter, but the largest trees are apt to be hollow. The wood is good, and said to be very durable, but as yet has been very little used except for shingles.

Sugar Maple.—The proper season for making sugar is March, the sap runs only on warm days which are preceded by keen frosty nights. The sap first drawn is always best; it then yields a pound of sugar to four gallons of sap. The sap last drawn is commonly fit only to make molasses. A sugar maple tree standing in an exposed situation will yield more sugar for the quantity of sap than one less exposed. The trees ought to be tapped with a chisel or an auger, not with an axe. In a good season fair-sized trees yield from two to three pounds each.

Olive-wood is again growing in favour, and for clocks and cabinet cases bids fair to continue so. Choice sticks go off at £12, and £10 is secured for no very exceptional stock. This wood is being used for a dress and garment fringe ornament, a dry-goods novelty for 1886.

Lance-wood gets a lift from the toboggan sports. This wood has been confined for service to dog-cart shafts and fishing-rods. It must be freshly imported as needed, else by storage it "dolts" or becomes blue. It had a favour in the archery days of 1881, but no such advance in prices as toboggans secured.

There would seem to be no doubt as to the adaptability of California to lemon growing. A single limb of one of the trees belonging to a Mr. Murphy is described as about three inches in diameter at one point and nine or ten feet high. "The number of lemons it has on cannot be stated, because no one has a day or two to spare time to count them."

Cupressus Nutkaensis (*Thujopsis borealis*).—This is the *Yellow Cypress* of the Canadians. It is an abundant coast tree on the mainland around Nootka Sound; it is also found in the interior of Vancouver's Island and in some parts of Queen Charlotte Islands. It often attains to 6 feet diameter. The wood is said to be strong, fine, and free of grain, pale yellow and very durable; it has been used to a limited extent for boat-building and various ornamental purposes, but is as yet little known in commerce.

The fruit of the elder, so frequently used for colouring spirits, will also produce a blue colour when treated with alum. The privet boiled in a solution of salt, furnishes a serviceable colour, and the over-ripe berries yield a scarlet red. The seeds of the common burning bush "euonymus," when treated with sal ammoniac, produce a beautiful purple red. The bark of the currant bush, treated with a solution of alum, produces a brown. Yellow is obtainable from the bark of the apple trees, the box, the ash, the buck-thorn, the poplar, etc., when boiled in water and treated with alum. A lively green is furnished by the broom corn.

FORESTRY

APRIL 1886.

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EDITORIAL NOTES.

On another page will be found an account of an interesting exhibit of various woods at present rare in commerce which has been prepared by the firm of Messrs. Shillinglaw & Son of Edinburgh, under the instructions of the Indian Government, for the Indian and Colonial Exhibition forthcoming this season in London.

A company has been formed in Bombay under the name of the Siam Forest Company, which will work a large concession of forest rights which have been granted to it by the King of Siam. The forests conceded to it are situated in the Valley of Moung Gnan, about 30 miles to the east of the town of Laikon, and they cover an area of over 2000 miles, much of the teak contained in them being of unusually large dimensions. The country is intersected by rivers which run into the great Menam River,—"Mother of Waters," as the Siamese name is,—on which the capital Bankok stands, and which will be the great outlet for the trade.

We gather from the recently issued annual report on the State Forest Administration in South Australia, that active operations are being carried on in that colony with the view of increasing the forest area. The work is done chiefly by means of planting, though there is incidental mention in the report of natural reproduction being also taken advantage of where available. Farmers and others are encouraged to plant by the free distribution of trees by the Government. During the last four years £1300 has been spent in this way, with the result that 400,000 trees are alive and well established. By comparison with the well-known large requirements of the colony in respect of the ameliorating effects of forest growth throughout its area, these operations may be looked upon as insignificant; but they are, as far as they go, beneficial and in the right direction. Circulars are distributed with the plants, which are to be returned to the Conservator of Forests in due time, with a report on the amount of success that has attended the planting of the trees sent to each recipient. Could not something of this sort be done by the owners of waste lands and the occupiers of the same in this country? It should be possible by some such scheme of mutual participation between the owners of our waste lands and the Government to plant these up. Or would it be an impossible thing for Government to acquire the waste lands of the United Kingdom by purchase and deal with them for the common good, if the owners cannot be brought to see that their own interests are largely involved in doing so? We are talking of buying out the proprietors of the sister Island. If we can accomplish that task with equity and national advantage, surely the acquirement of the waste lands of Great Britain by the Government would be a light task by comparison, and would eventually result in an enormous increase of national wealth.

Timber merchants are anxiously watching the progress of an American invention for drying wood by a quick process in which cold air plays an important part. Instead of wasting time and causing loss of interest on capital in the shape of timber on hand, which needs three to seven years to mature naturally, it is claimed for the new process that it matures wood in three days. A tree felled to-day can be delivered, sawn into shape, and ready for use in the building and furniture trades next week. Of course, such a process, if really effective and cheap, tends to make the immense stocks of timber in the docks still more cumbersome than before, and the discovery is therefore no good news for the capitalists engaged in the wood trade.

Sandal-wood, we learn from our contemporary *The Indian Agriculturist,* is threatened with extermination. The average annual income from this one article alone is about five lakhs of rupees, or about £50,000, and this, it is said, represents an output of about 1000 tons of heart-wood. It is only the heart-wood that has any commercial value, and the tree never attains greater dimensions than a considerable shrub. A thousand tons, then, of what is really a comparatively light timber must represent an immense sacrifice of the trees annually, even if to make up the total weight every part of the tree were thrown in. But such is not the case, for the sap-wood is of no value, and is cut away from the trees when they are felled, and permitted to go to waste. The sandal-wood forests in Mysore are a Government monopoly, and the people of the State are not directly interested in their preservation; and thus the work of extinction of the existing stock is accelerated by preventable causes, while there appears to be no adequate steps taken either to protect, conserve, or renew it. The plant thrives only in certain districts, and these are so few that special means should be adopted for the conservation of so valuable a forest product. One region—Manbhoom—in which it formerly was plentiful, is now practically denuded of it through reckless waste. The value of sandal-wood will be realized by a note on the subject on another page in this issue; and we hope to hear that the authorities are taking steps to prevent the destruction of a forest product for which there is no worthy substitute.

TREES (IRELAND) BILL.—The second reading of this Bill was moved on the 5th ult. by Mr. Gilhooly. The object of the Bill is to give Irish tenants rights in any timber they might plant. The Attorney-General said that, in the absence of the Chief Secretary to the Lord-Lieutenant, he might state that the Government would offer no objection to the second reading of this Bill. He thought the objects aimed at by the Bill were highly to be desired, and it was of great importance that every inducement should be given to tenants to plant trees upon their holdings. It might be a question whether some simpler form than that provided in the Bill for certain purposes should be provided, but that was a question for Committee. Major Saunderson said that the Irish landlords had no objection whatever to this Bill; on the contrary, they thought it would be extremely useful. He only regretted that the example was not more universally followed, and that greater encouragement was not given to Irish tenants to plant trees. While some modifications might be introduced into the Bill in Committee, he saw no objection to the second reading being taken. Mr. Marum observed that a measure similar to this was before the House last April, and Lord Ashbourne gave his assent to the principle of it. He was gratified to find that Her Majesty's Government had agreed to the second reading of the Bill. The Bill was then read a second time. The Bill has since the above was sent to press been read a third time, and passed.

PATENTING HEDGES.—It could only have occurred to our Yankee friends to conceive of patenting any method of planting a hedge. It is hardly even conceivable that such an idea could have found a resting-place in that ceaseless projector of notions, the Yankee brain, for such a length of time as would "lick it into shape." It is so absurd. But it is nevertheless a fact that it has not only been conceived but acted upon, and even prosecution is threatened in consequence of an infringement of the patent rights. The

"Dayton Hedge Company" of Ohio is the patentee, and the "Michigan Hedge Company," which we gather from the *Albany County Gentleman* is a branch of the first-named company, is the cause of so much trouble in the district in which it claims to operate, that the press is taking the matter up with, we should think, good reason in the public interests. We have it on high authority that there is nothing new under the sun, and we certainly thought that anything new in such an ancient and well-worn subject as hedge-planting was hardly possible. We also thought, on noticing the correspondence in our American contemporary, that there must necessarily be something specially good and novel in a method of planting that had been deemed by our shrewd relatives over the Atlantic worthy of protection by patents. On examination, however, we find there is nothing in it; the system being that of bending or laying the stem of the plant underground, which was practised more or less both in this country and in America by the great-grandfather of the oldest inhabitant of either country. To our old-world insular intellects the claim of this American "Hedge Company" appears incredibly absurd; but as we gather from our contemporary that the agent of the company, in fulminating his threats of prosecution of those who infringe the patent rights in question, has 150,000 dols. to do it with, we are constrained to believe that to a certain section at least of the Yankee mind it has bottom in it.

We note that French forestry authorities are not fully satisfied with nor even agreed on the merits of their own Forestry School at Nancy. It appears from some correspondence that has recently been published by the *Revue des Eaux et Forêts,* that there exists an opinion among those who may be supposed on the other side the English Channel to know, that there is room for improvement in both the theoretical and practical instruction given to students at that establishment. It is even proposed by one writer to abolish the Forest School altogether, and attach the students to the Agricultural Institute at Paris. The leader in this proposed innovation is M. Marcel Taillis, who claims for his proposal that better instructed officers would be turned out, and that it would be more economical both for the State and for the students. We do not pretend to be able to express an opinion on the merits of the question as put by M. Marcel Taillis, but it occurs to us that his implication of inefficiency, and the proposed sweeping change which he recommends as an improvement, should have been more powerfully supported by facts and evidence than they are. He presents little, if any, proof of the inefficiency of the system of teaching at Nancy; and with regard to the proposed removal of the students to Paris, we fail to see from anything he advances what advantage is likely to result from it as regards any improvement in the qualifications of officers turned out. M. B. de la Grye, who takes part in this correspondence, considers that there is room for improvement in the practical training of students at Nancy, so that we may almost take it for granted there is something wrong in the establishment somewhere. Yet it appears to our mind a strange remedy to suggest their removal to Paris. Surely it were easier to improve their practical training at Nancy than at Paris. The economical aspect of the question is entirely beyond our understanding, but we can hardly believe the State would entertain the question by itself apart from that of the maintenance of the highest state of efficiency in the education of its forestry officers. As regards the alleged economy to the students from the proposed change, we think with M. B. de la Grye that money would be easier spent in Paris that at Nancy. In this country, in such a case, we would most probably set about reforming the abuses complained of, if any really existed, rather than blot out such an essential national establishment; but we may leave our neighbours to manage their own affairs in their own way. What concerns us most, in view of such complaints in France, is the question, Have we been acting wisely in sending our students to a school whose efficiency is challenged by those who may be presumed to know well the grounds on which they base their charges?

THE success of the motion of Mr. Labouchere in the House of Commons for reducing the vote for public parks and gardens in the metropolis, must have caused some alarm in the minds of all interested in the efficient maintenance of the great national Botanic Gardens at Kew. The object of the motion was, of course, to relieve the imperial taxpayer of the burden of the maintenance of institutions in the benefits of which he is but a very limited participant, and to lay it on the ratepayers of the metropolis. The principle on which the motion proceeded—that of compelling the maintenance of local institutions by local rates—is sound in itself, and commended itself to the mind of the present House of Commons strongly. But it is to be feared a large number of those who voted in the majority did not realize the fact that Kew Gardens, and certain of the London parks, are public or royal property, which must be administered by the Government, and maintained by the public purse. It cannot be said that the public in the national sense derive any direct benefit from the London royal parks, but neither can it be alleged that the London public enjoy them exclusively, and it therefore would be unjust to fetter the latter with the cost of the maintenance of property over which they have no right of control. In the case of the Royal Gardens, Kew, the whole empire, it may be said, participates directly in the benefits which flow from it as an agency for the dissemination of scientific and economic knowledge. Any hampering of the machinery of that institution under the plea of economy or from finical notions of justice in the incidence of taxation, would be little short of a national disaster—certainly it would be a national disgrace.

We are pleased to observe that Sir J. Lubbock moved in the House of Commons on 23rd March the appointment of a Select Committee to consider whether by the establishment of a Forest School or otherwise our woodlands could be rendered more remunerative. The motion was agreed to.

ON ENDEAVOURS WHICH HAVE BEEN MADE, WITHOUT SUCCESS, TO EFFECT THE ESTABLISHMENT OF A NATIONAL SCHOOL OF FORESTRY IN BRITAIN.

BY REV. J. C. BROWN, LL.D.

IN a preceding article entitled "Practicable Arrangements if Government Aid should be required in the Establishment of a National School of Forestry in Edinburgh," I submitted for consideration advantages and disadvantages attaching respectively to the establishment by Government of a Professorship of Forestry in the University of Edinburgh, and of the establishment of a National School of Forestry in connection with the Edinburgh Museum of Science and Art, in which forestry might be studied on terms similar to those of the Royal School of Mines and Practical Geology in London, and the Royal College of Science in Dublin. And in another I have brought under consideration the expediency of employing national funds in the establishment of a National School of Forestry.

A few gentlemen with whom I have been associated acting as a committee, appointed at a Conference held in the International Forestry Exhibition held in Edinburgh in 1884, to consider the practicability of establishing in Edinburgh a National School of

Forestry, and with power to act, are endeavouring to raise £10,000 by subscriptions for the endowment of a Professorship of Forestry in the University. We are doing so under discouraging circumstances, making the endeavour, we may be allowed to think, the more creditable to us, but suggesting also the expediency of preparing for the possible contingency of our not obtaining the amount required. It was in view of this that these articles were written; but it may with propriety be asked, Has it come to this, that if the committee do not succeed in raising that amount by private subscriptions, the alternative must be an appeal to Government either to make a grant in aid, or to undertake the work and carry it out as a Government measure? The design of this paper is to supply information in regard to what has been done, and so to enable any one to form on this point an opinion for himself.

In the spring of 1877, I published a *brochure* entitled *The Schools of Forestry in Europe: a Plea for the Creation of a School of Forestry in connection with the Arboretum in Edinburgh*, in which, with details of the arrangements made for instruction in forest science in Schools of Forestry in Prussia, Saxony, Hanover, Hesse, Darmstadt, Wurtemburg, Bavaria, Austria, Poland, Russia, Finland, Sweden, France, Italy, and Spain, and details of arrangements existing in Edinburgh for instruction in most of the subjects included amongst preliminary studies. I submitted for consideration the opinion "that with the acquisition of the Arboretum, and with the existing arrangements for study in the University of Edinburgh, and in the Watt Institution and School of Arts, there are required only facilities for the study of what is known on the Continent as Forest Science to enable these Institutions conjointly, or any one of them, with the help of the others, to take a place amongst the most completely equipped Schools of Forestry in Europe, and to undertake the training of foresters for the discharge of such duties as are now required of them in India, in our colonies, and at home."

Thereafter I was invited by the Council of the Scottish Arboricultural Society to attend the annual meeting of this Society, and bring the subject before the assembled members, which I did. The President, the Right Hon. W. P. Adam, of Blair Adam, M.P., in his opening address, referring to the subject in question, said:—

"He cordially endorsed and enforced what had been so well begun. There would be, no doubt, some difficulties in obtaining recognition from Government of this necessity, and it would probably not be till after a long period of pressing application, and till public opinion had been brought to bear, that the public purse-strings would be drawn. Another difficulty was the fact that, whatever may be the case in India and the colonies, we have at home no large forests under the charge of Government, and this was an obstacle in the way of the practical education of foresters; still, in spite of these difficulties and drawbacks, he considered that in a country like this, with so many dependencies and colonies where a knowledge of the science of forestry is so necessary, it is absolutely essential that a School of Forestry should be established. It was the duty of the Society, therefore, to awaken an intelligent interest in this question; and he for one would be glad to do all that he could in and out of Parliament to further this praiseworthy object. He would have wished further to illustrate the necessity for good Schools of Forestry by what was now taking place in India. The wanton destruction of forests in that country had been going on for years. Who could say that the terrible famine which was now devastating some of the fairest provinces of the empire might not be directly traceable to the improvidence of man in denuding the country of its natural vegetation, and so altering all the climatic arrangements of nature?"

The paper read by me was printed in the *Transactions* of the Society, and subsequently reprinted. Before the close of the year, a copy of the *Plea for the Creation of a School of Forestry in connection with the Arboretum in Edinburgh* was forwarded by the Secretary of State for the Home Department to the Scottish Education Department, and afterwards, on the recommendation of this Education Department, to Her Majesty's Office of Works; and subsequently a copy of the paper on "Schools of Forestry," read before the meeting of the Scottish Arboricultural Society, and published in their *Transactions*, was forwarded to the Office of Works from the Home Office.

By the then Secretary of State for the Colonies, copies of the *Plea* were at the expense of the Government "addressed to those Colonial Governments which are principally concerned in this important question;" and by his successor, copies of the paper on "Schools of Forestry," read by me before the Scottish Arboricultural Society, with reprints of a Review of suggestions relative to the formation of a British School of Forestry, which had appeared in the *Journal of Forestry*, and copies of one or other of accounts of Schools of Forestry at Evois in Finland, at the Escurial in Spain, at Hohenheim in Wurtemburg, and at Carlsruhe, reprinted from the *Journal of Forestry*, were at the expense of the Government sent to the Governors of Colonies, to which copies of the *Plea* had been sent by his predecessor.

Of the results I know little, but the following statement I find embodied in a minute from Sir Henry E. Bulwer, the Lieutenant-

Governor of Natal, to the Colonial Secretary, after a somewhat lengthened and accurate digest of my *Plea for the Creation of a School of Forestry in connection with the Arboretum at Edinburgh*:—

"10. I transmit Dr. Brown's letter and work (Dr. Brown to the Earl of Carnarvon, 13th April 1877; *The Schools of Forestry in Europe*, 1877); and I refer to them, and to the proposal he makes, because I consider that the information which he gives and his proposals are of considerable importance in themselves, and deserve our attention in this colony, if we would do anything, as I think we ought to do, towards the conservation and cultivation of forests, and towards promoting with that object some knowledge of forestry for the benefit of the colony."

A commission was subsequently issued to the First Puisne Judge of the Supreme Court, the Surveyor-General, and others, who, under date of March 5, 1880, presented to the Governor a carefully prepared report. In the closing paragraph they say: "The immense interest the subject of Forestry is now assuming, as evinced by the voluminous labours of Dr. J. C. Brown at the Cape of Good Hope, and the incessant applications of Sir J. D. Hooker, of the Royal Gardens, Kew, together with the spirit of fervid inquiry throughout the whole of the British Colonies, should impress upon this colony the necessity for intelligent action on the part of its European and native inhabitants, individually as well as collectively, which his Excellency the Lieutenant-Governor has pointed out."

In a fortnight the Lieutenant-Governor issued a brief minute expressive of his interest in the report, noting its suggestions, inclusive of one that the services of some persons skilled in forestry should be obtained. But a dark cloud was gathering over the land. He intimated that time failed him to do so at greater length; but suggested that the report should be laid before the Executive Council, and that it would probably be found useful to have it printed, which was done.

Thereafter the colony was for long surrounded with war. War in the north, war in the south, war in the west. War, wars, and rumours of wars, and I suppose nothing further has been done in the matter; but the whole contents of the Blue Book, like the citations which have been given, indicate that a demand is likely to arise ere long in the colonies for trained, educated, and instructed foresters, such as Schools of Forestry may supply.

The opinion held in the Colonial Office was that if a good School of Forestry should hereafter be established in this country, it was possible that students might be attracted to it from some of the colonial possessions of Her Majesty; but so far as could be judged at that time it was not likely that the colonies would be prepared to take any active step toward the establishment of a school; and I understand that with the printed papers specified there was transmitted copies of a letter submitting for consideration that the publication of the report by the Royal Commission to inquire into the constitution, etc., of the Scottish Universities, made in March 1878, supplied a befitting opportunity to give effect to the recommendation of the Education Department relative to the creation of a School of Forestry in connection with the Arboretum at Edinburgh.

By the Agent-General for New Zealand, there was forwarded to the Government of that colony first a copy of the *Plea*, and afterwards a copy of the paper on "Schools of Forestry," reprinted from the *Transactions* of the Scottish Arboricultural Society; and a statesman, whose views are entitled to every consideration, wrote to me on the subject:—

"No doubt it would be well that so-called foresters should have some scientific knowledge of the craft which they profess, but of which I fear many of those employed in England and Scotland are grossly ignorant. But, on the other hand, in a country in which, except in a few districts in England, there are no State forests, and where the fuel used is coal, I hardly think the Government or taxpayers will be disposed to go to any expense such as these Schools of Forestry must entail. Further, I cannot think we can be expected by means of establishments at home to provide forestry for the colonies and India. In India they appear to be doing very well as it is.

"Such are my first impressions on reading your observations on this subject, which are evidently the result of much thought and full inquiry, and therefore I feel it is presumptuous on my part to write as I have done somewhat in opposition to them."

On the other hand, in an editorial note in the number of the *Journal of Forestry* issued in March 1879, it is stated:—

"We regret to find that no attempt has yet been made to reduce the enormous expense to which the country, and the parents or guardians of a pupil, are put to pay for his training in the Forest School at Nancy, an institution, too, be it observed, that does not at all meet the requirements necessary for the *proper* training of first-class forest officers for the management of the forests in British India or in the colonies. Each pupil costs, for fees and maintenance, £220 per annum, of which heavy sum the parents are held liable to pay £180, which may be reduced to an average of £120 per annum by the industry and good conduct of the pupil; in reward for which the Government, at its discretion, pays the difference, £60 per annum.

"Such heavy charges can only be afforded by the opulent classes, and very much exceed the cost of training for any other profession in this country. They are also quite prohibitory to the young men best qualified by nature and early training for filling the office of forest officers in India or elsewhere. For less than half that cost per head per annum we train our clergy, doctors, lawyers, naval and military officers, engineers, etc.; in fact, we do not know of any professional training which necessarily requires such an enormous expenditure for such poor results. Suppose there is an annual average of fifteen pupils being trained at Nancy for the Indian forest service. This would give a total cost of £3300 per annum. Such a large sum properly expended in training forest students in a Forest Department in connection with any of our universities would train fifty students in place of fifteen, and make much superior men of them for the duties they are called on to perform in the management of our home, colonial, and Indian forests. The *special* training for India, or any colony, should be taught in that country. The science and technics of forestry can be better and more economically taught in Britain than anywhere else, and the practical training specially necessary for any particular country cannot be so well taught anywhere as on the spot where it has to be put into practice."

In such circumstances, there was made to the Council of the Arboricultural Society in 1878 an offer of the delivery of a series of twelve, twenty, fifty, or any number of lectures which might be desired, on the "Forest Lands, Forest Science, and Forest Economy of Continental Europe," with recapitulations, examinations, and perusals of reports by the students of observations, or other exercises, all with a view to testing by experiment whether the Continental School of Forestry can be adapted to the conditions of our country.

Nothing came of this; but the Society having in the following year, 1879, published in their annual report that they had for many years sought, in the interests of the country, to secure the establishment of a School of Forestry in Scotland, there was made to them in the autumn of 1881 an offer of the delivery of seventy-five lectures, and class examinations on subjects comprised in *Forst-Wissenschaft* or Forest Science, if they would provide a class of not fewer than twelve students, take the direction of the other studies of the class, test by appropriate periodical examinations the attainments being made by the students, and meet from their funds the necessary expenses, but recouping themselves so far as practicable by fees, so as to demonstrate the practicability of the measure. The Secretary replied to the effect that the proposal had been submitted to the Education Committee and Council of the Society, and, when fully considered, their views would be communicated. No communication having been received, the offer was renewed in the following autumn, but nothing came of it.

Meanwhile, or subsequently, the expediency of combining with existing arrangements, or contemplated arrangements, provision for the study of forestry had been or was submitted for discussion in the following bodies in Scotland:—The Royal Society of Edinburgh; the Royal Scottish Society of Arts; the Highland and Agricultural Society of Scotland; the Magistrates and Town Council of Edinburgh; the Governors of the Watt Institution in Edinburgh; the Andersonian University of Glasgow; the University of St. Andrews, in view of the establishment of an affiliated College in Dundee; the Trustees of the Fordyce Lectureship on Natural History, Chemistry, and Agriculture, in connection with the University of Aberdeen. In England, for some years it had been the desire of the Council of the Royal Agricultural College at Cirencester to combine the study of forestry with the other studies pursued there. In London, there was a proposal to establish a Polytechnicum, or College of Science and Manufactures, with funds contributed by the various companies of the Corporation, and by the officials of more than one of these companies was the expediency of combining with other arrangements provision for the study of forestry brought under consideration; and on Epping Forest becoming the property of the Corporation of London, a suggestion was made by Mr. Alexander Mackenzie, who had been appointed superintendent of the forest, that a School of Forestry should be established in connection with the forest, for which, he said, there was a combination of circumstances which seemed to tend to a hope of success. And in the number of the *Journal of Forestry* for February 1881 there is given (pp. 673–676) the text of a memorial presented by him to the Epping Forest Committee of the Court of Common Council, in which he unfolds his scheme—a scheme which in all its details is well deserving of serious consideration, as are also observations made in support of his suggestion. From this a citation has been made in a preceding article. (*Ante*, p. 545.)

Since then arrangements have been made for the study of Forestry at the Royal Engineering College at West Hill. But the fees, amounting to £180 per annum, prevent this being legitimately considered a National School of Forestry.

THE LARCH AS AN AVENUE TREE.

CONSIDERING the grace and beauty of the larch, and the rich variety and delicate hues of its foliage from the time it opens in such tender beauty in the spring to the time it sheds its golden foliage in the autumn, it is surprising that it has not been more used as an avenue tree. It is almost impossible to conceive anything more pleasing than long single or double lines of larches supporting a straight road of a mile or more in length, till they vanished into a point in the far distance, and seemed to pierce the blue sky. Unless indeed it were similar lines contrasted behind with others of the white or the Douglass spruce. I am anxious to hear from your readers whether any such avenues now exist in this country, and what valid objections can be urged against their use on soils and situations suitable for their growth.

It has long been a puzzle to me why such beautiful and withal such common and useful trees as the larch, spruce, and Scotch pine are not more employed for avenues, and the formation and enrichment of landscapes. Can this paucity of use for ornament have arisen from their general planting for profit? If so, it is time that such artificial boundaries between trees for ornament and profit were abolished. Of course in districts where extensive plantations of either of these trees abound, it is not only natural, but in harmony with correct taste, that landscape gardeners and the planters of avenues should choose, as far as practicable, other trees than those used in such broad masses in plantations. The desire for new forms and colours, and the necessity for novelty as well as contrast, render this imperative.

But this is no reason at all why those so-called common trees should not be used for the formation of avenues, and in landscapes in districts where other and very frequently the more common deciduous and round or spreading headed trees predominate. Though fashion prevails to such an extent in these matters that our best, fastest-growing trees are too often set aside in favour of others, selected in virtue of their rarity or exotic origin, and also because, forsooth, they are never likely to be grown in our climate for the value of their timber. This is altogether a spurious taste, for other conditions being equal, the more valuable the timber is likely to become of any tree employed either in forming avenues or landscapes, the more freely it should be planted; and happily in arboriculture beauty and utility are very frequently linked together. Though these trees are especially suggested for avenues, of course neither of these, nor any other coniferous trees, including our cedars of

Lebanon, may ever form such magnificent avenues as lime, plane, beech, oak, the sweet or horse chestnut, or poplar. And those who always associate avenues with the Gothic or round arches formed by such trees will not be likely to try larches or spruces. But the primary meaning of the word avenue is simply one or more lines of trees supporting the sides of a road, walk, path, or street, generally straight, but occasionally winding, so that virtually any two parallel lines of trees form an avenue. As already stated, lines of stately larches would, from the light character and changing hues of their foliage, the stature and straightness of their trunks, and the symmetrical growth of both boles and boughs, have a very pleasing effect. Some may object to the larch because it is deciduous. To me that is one of its greatest merits. For charming as is this tree in all stages of its growth, its towering trunks and leafless boughs in their delicate ramifications are almost equally beautiful. Some would say even more so, especially when their smallest twigs are transformed into crystallized icicles during the prevalence of those rime frosts that clothe our landscapes and forests in white robes, and transform all our trees into brides. D. T. Fish.

THE GIANT ARBOR-VITÆ

(*Thuia gigantea*).

BY A. D. WEBSTER, PENRHYN CASTLE, NORTH WALES.

"SUBSTITUTES for the Larch" has, on more than one occasion, been the title of articles written for your columns, but amongst all the trees recommended for this purpose by the authors of such, none, in our opinion, can equal or approach the above, if, perhaps, we except the most valuable of all — *Pinus Laricio.* Nuttall, in his *Plants of the Rocky Mountains,* Professor Sargent, in *Catalogue of the Forest Trees of North America,* Dr. Newberry, Sir E. Belcher, and numerous others have all spoken in the highest terms of *T. gigantea* as a handsome, hardy, and valuable timber tree —sentiments that we feel almost inclined to substantiate from specimens growing on this side the Atlantic; for certainly as a hardy, fast-growing timber tree, that is neither influenced, at least to any great extent, by altitude or soil, it has few rivals, and is already fast gaining ground in the estimation of that important portion of the British community—tree planters. Some of your readers may, perhaps, think that we are over-belauding the tree, but not so, for in the following notes nothing will be adduced that we are not well prepared to substantiate, few English estates being able to boast of possessing either larger individual specimens or a greater number than may be seen at Penrhyn.

Perhaps no tree has been, and indeed is at present, surrounded by so much confusion of nomenclature as the subject of this paper, for in this country alone it has been sent out under no less than four distinct specific names, and indeed the confusion is by no means diminishing, but rather becoming worse confounded. Even as regards the honour and date of introduction, arboriculturists are still at "loggerheads," Veitch in their *Manual of Coniferæ* stating that it was introduced to this country by them, through their collector, William Lobb, in 1853,—a statement, however, that justly receives but little credence from our Edinburgh friends; for in the *Transactions and Proceedings of the Botanical Society of Edinburgh*, 1873, Mr. James M'Nab, than whom few knew better, tells us that "A *Thuia*, raised from seed, and proved to be the true *Thuia gigantea* (Yellow Cypress), is another acquisition first sent by Jeffrey. At first the seedlings resembled *Thuia occidentalis*, and little attention for a time was paid to them." This statement, which was portion of a rather lengthy paper written by Mr. M'Nab for the sole purpose of giving the name of Jeffrey credit for work that the man Jeffrey had actually performed, is to some extent substantiated, certainly rendered all the more probable, as specimens taken from three of the very trees raised from seed sent by Jeffrey to the Oregon Association of Edinburgh, and now growing in the Botanic Gardens there, were, less than two years ago, recognised by some of the Kew authorities as "forms of the true *Thuia gigantea*;" the word *forms* in this particular sense meaning a great deal to those who know how variable seedlings of *T. gigantea*, the offspring of even one tree, usually appear. It is also well to bear in mind that both *T. gigantea* and the nearly allied *T. plicata* are growing side by side in their native wilds, which, coupled with the fact of at least two more of Jeffrey's seedlings being recognised by the above-mentioned authorities as *T. plicata*, also goes far in substantiating Mr. M'Nab's remarks. When sending the above specimens to Kew for examination, the Curator of the Edinburgh Botanic Gardens seems to have stated that they were taken from plants "raised from seeds sent to Edinburgh by Jeffrey in 1851." This is well known to be correct, which with the plants' recognition as forms of the true *T. gigantea* and by so high an authority gives Jeffrey's claim at least two years' priority of right over that of Lobb.

Now as regards the confusion of nomenclature (but it may be well here to point out that the subject of this article has also been sent out under the names of *Thuia Menziesii, T. Lobbi,* and *Libocedrus decurrens*), the tree under notice, *T. gigantea,* is the true *gigantea* first described by Nuttall in his *Plants of the Rocky Mountains,* the plant erroneously so named being *Libocedrus decurrens*—a tree as widely different both in foliage and general appearance from *T. gigantea* as might well be. *Libocedrus decurrens* was sent home by Jeffrey in 1853, and named *Thuia Craigiana* by the Committee of the Oregon Association, they at that time not being aware of the previous description by Nuttall. Carrière, believing that Jeffrey's introduction was identical with *Thuia gigantea* of Nuttall, dropped the name of *Libocedrus decurrens,* and gave it that of *T. gigantea.* About two years after Jeffrey's introduction, Lobb sent home the same tree, but Messrs. Veitch, finding that a *T. gigantea* was already in circulation, and perhaps not recognising in his specimens the true *T. gigantea,* bestowed on it the name of *T. Lobbi.* In this way originated the confusion of synonyms which, even to the present day, has never been got rid of, *T. Lobbi* and *T. Menziesii* being but *aliases* for *T. gigantea,* this latter being now the recognised and standard name; while *Libocedrus decurrens* (alias *Thuia Craigiana*), with which it has been confused, is a perfectly distinct and well-marked species belonging to an entirely different though nearly allied genus.

Thuia gigantea is a majestic tree inhabiting the north-west coast of the United States, where it attains heights ranging from 50 feet to fully 150 feet, with a clean, gradually tapering stem of from 3 feet to, in some instances, as much as 12 feet in diameter. In its native country it is highly prized, not only as a timber producer, but for its bark, which is of great value in the manufacture of ropes, mats, clothing, and other articles of domestic economy. The timber is prized by the American cabinetmaker, as it works readily and takes a good polish, while most of the canoes made on Vancouver's Island are cut out of it, as also boats and ships; while for lasting qualities it can surpass most of the native timbers, for we have been told that in repairing an old fort the only log found sound after twenty-one years' trial of those used for "underpinning" was a stock of this. In this country, *Thuia gigantea* has proved itself to be a tree of very rapid growth, for already, though only five-and-thirty years introduced, many specimens of 70 feet and upwards are to be met with, thus proving that the climate of Britain is well suited for the development of this stately, fast-growing tree. On this estate the annual rate of growth exceeds that of most other trees, though, perhaps, the increase in bulk of stem may be somewhat deficient, trees of 60 feet in height usually girthing about 4 feet at a yard from the ground, the straight, clean stems terminating in a leading shoot that is as thin and pliable as a whip handle. The branches are numerous, very irregularly arranged along the stem, and short in proportion to the tree's height, the branch diameter of a 50-feet specimen being usually but 12 feet at the widest part. They are placed at right angles to the stem, or nearly so, and with up-curved tips, very flexible, and covered with scale-like, finely-pointed leaves, which are of a bright glossy green on the upper side, and distinctly glaucous beneath. Cones clustered near the ends of the branches, fully half an inch long, and resembling very closely those of the common American arbor-vitæ. They are produced in great abundance at Penrhyn, but usually only on the top half of the trees, and when fully ripe impart, from their great quantity and light-brown colour, a by-no-means uninteresting feature to the trees.

Perhaps the finest examples of the growth of *Thuia gigantea* here occur on deep, sandy, rather moist loam; but I should say that as regards choice of soil this tree is far from particular, for we have also rapid-growing, well-furnished specimens on rocky *débris*, deep, well-decayed vegetable matter, rough sandy soil, and in loam of a rather stiff, plastic nature, thus showing that, unlike some other conifers, the one in question is far from difficult to please in the way of soil. As to exposure, it is also to a great extent indifferent, although there is certainly a marked difference between trees growing in open, sheltered situations in the park and such as have been planted out in bare, exposed places over the estate; but this, at least on Penrhyn, is not to be wondered at, for although the park and adjacent maritime grounds are fairly mild and sheltered, still the plantations on other portions of the estate more inland suffer severely at times from the long-continued south-western blasts to which we are particularly susceptible. I do not say that in such situations it will not thrive, and when circumstances are taken into consideration thrive well, but what is meant to be understood is that in well-sheltered places near the sea, the annual rate of growth is considerably in advance of what it is when the tree is grown farther inland and in exposed situations.

In stiff, tenacious soils, such as approach clay in texture and that are more or less impervious to moisture, we cannot say that this tree progresses in a very satisfactory manner, or makes the long, clean annual growth that is so characteristic of it when planted in almost any other soil, not even excepting prepared peat bog. The average annual rate of growth of twenty-four trees of *Thuia gigantea*, growing under ordinary conditions in the park here, is 22 inches; but even this is, I think, surpassed by young trees of 8 feet to 10 feet growing in our home nursery. We may add that the largest specimen of this *Thuia* at Penrhyn is 72 feet in height, with a bole girthing at 3 feet and 5 feet, 4 feet 9 inches and 4 feet 7 inches respectively, and a diameter of spread of branches covering 13 feet. There are, however, several of about the same size, but I believe the one whose dimensions are here given to be about the best. The trunk is in every instance remarkably straight and clean, and covered with thin, smooth, but somewhat scaly brownish-black bark. I have never known even one instance in which this tree has suffered from the effects of the wind; even during the memorable "Tay Bridge gale," when nearly every other species was more or less maimed, the *Thuia gigantea* stood unharmed, and passed through the trying ordeal without loss of either branch or leader—indeed, at the time its immunity from harm was the source of comment on several occasions. The leading shoot is so plastic that I have on more than one occasion tied it in a knot without effecting the least damage, and when released, it springs back to the original position in a manner that is quite surprising.

The nursery management of *Thuia gigantea* is of the simplest description; indeed, I know of no conifer that is more readily raised from seed, transplants with greater safety, or gives less trouble in the way of pruning or training. Ample space, it may, however, be well to say, should at all times be allowed it whilst in the nursery borders, and oft-transplanting, as with other trees, induces the formation of numerous rootlets; therefore to have nice, bushy, well-rooted plants, the two requisites alone are plenty of room and frequent removals. As it grows very rapidly, this *Thuia* can be planted out permanently when of a few years' growth; but although such a course is well enough suited for general forest planting, we find it a good plan, when the tree is wanted for decorative purposes, to keep it in the nursery till a height of say 8 feet or 10 feet is attained, at which size it transplants with perfect safety.

By way of experiment, we, three years ago, planted a small piece of ground with *Thuia gigantea* at 24 feet apart, the intervening spaces being filled up with larch, Scotch fir, and some hard-woods for removal at an early date. The standards were from 5 feet to 6 feet high at time of planting, bushy, and well rooted, so that they started away vigorously during the following spring; but the position of the ground being somewhat exposed has naturally retarded growth to some extent compared with what the trees previously formed whilst in the nursery ground. So far, however, they look well, but it is yet premature to speak with any amount of certainty regarding their value for withstanding the rather adverse influences of both soil and exposure to which they have been subjected. Where planted amongst the general run of forest trees, they certainly augur well, and in several cases where rather confined spaces have been allowed them, they seem to suffer but little, rushing up with clean, straight stems where, in several instances, their branches are commingled with those of the adjoining trees.

The timber produced in this country is, judging from specimens included in a collection of the various kinds grown on this estate, of good quality, being light, tough, and very readily worked. It is of a pleasant yellow colour, remarkably fine-grained, and takes a good polish. Regarding its lasting qualities I know but little, too short time having elapsed since the timber was felled of which I write; but judging from several trials that have been made, it certainly shapes well, and, I may add, has so far given perfect satisfaction, but no doubt, when more perfectly matured, these qualities will be correspondingly increased. In conclusion, from my present knowledge of *Thuia gigantea* as grown in this country, combined with its well-known value abroad, I have every reason to believe that a bright future is before it as a British timber tree, and that amongst the recently introduced conifers, whether for ease of culture or strong, hardy nature, it is well able to hold its own, and rank with such as the Douglas fir, Corsican pine, and that too little known silver fir—*Abies Nordmanniana*.

CONCERNING THE FORESTAL USEFULNESS OF MILLIPEDES.

INFORMATION on this subject has been supplied by Keller in the *Swiss Periodical for Forestry* (1886, No. 1). It is the pair-footed millipedes which, according to Keller's observations, have to be recognised as friends and allies of the forester in his battle against wood destroyers. They have a long flattened body, and a shield-shaped head, with powerful jaws, which at once declare them to be flesh-eaters. Our authority has till now confined his observations to the "brown stone-crawler" (*Lithobius forficatus*, L.) which keeps itself mostly under stones and the bark of trees. (It need hardly be mentioned that *Lithobius* is not in a literal sense a millipede, nor even a centipede, although so classified, since it has not more than fifteen pairs of legs.) At the building of the new chemical laboratory in Zurich, a great many loads of spruce firs were brought in to be used as underground timbers. Many of these spruces were infested with the bark beetle, *Bostrichus typographus*. When the bark was scaled off, many of the swift millipedes were to be seen employed in destroying the young bark beetles before they were fully coloured. Of many bark beetles all that remained to be seen was the empty cases, while others had just been killed by tearing out the hinder body. Millipedes, like spiders, devour only the soft contents of the insect; the indigestible horny casing they leave where they found it. Another time Keller observed on an elm, which had been badly attacked by *Scolytus Geoffroyi,* numerous dead specimens of this plague, and these, too, *Lithobius* had rifled of their contents. A wood of *Pinus cembra,* in the neighbourhood of Davos, supplied Keller with material for a third observation. In this compartment there was at the same time split wood for burning piled up, as well as whole stems laid on the ground; and most of this timber was much infested with *Bostrychus cembræ,* the bark beetle of the *cembran* pine. On scaling off pieces of bark there were to be seen alongside of the living beetles many empty shells. Keller detected one stone-creeper in the act of feeding on a *cembran* bark beetle, so that therefore there is no doubt but that the millipedes must be enrolled as a new order among the number of those living creatures which are useful to the forests.—*Centralblatt für das gesammte Forstwesen.*

CHAPTERS ON PROPAGATING.

BY A NURSERYMAN.

PROPAGATING BY CUTTINGS.—The art of increasing stocks of plants by means of cuttings is an old one, but its development has been slow as regards its application to the more difficult classes of plants, such as Cape heaths and New Holland plants. Indeed, the propagating of these and other similarly intractable subjects is even now somewhat of a sealed art, almost exclusively possessed by that important personage in every complete nursery establishment—the professional propagator. Fortunately, most of the subjects with which the forester ordinarily has to deal are easy of management, and require the use of no very special facilities in the way of propagating houses and other adjuncts which are indispensable when the operations include a wide range of subjects.

The rationale of the process is based on the inherent power of almost any part of a plant to form roots and establish itself, when by accident or intention it is detached from the parent stem. This vital power is possessed in a much larger degree by some plants than by others; many have it in such a high degree, that their roots, stems, branches, leaves, and flower stems, if chopped up, will in favourable circumstances form independent plants. Incidentally it may be remarked here that there are many curious evidences of imperfect possession of this latent vital force, which are, to say the least, puzzling. It is an easy matter, for instance, to induce the leaf of a cucumber to emit roots and live for a time, perhaps as long as the average duration of the life of the parent plant, which is annual. But it is impossible to induce it to send forth a stem; it is imperfect in this respect, that, while it can develop the descending axis or the roots, it does not possess the power to produce the ascending axis or stem, and consequently no plant in the complete sense can result from the process. In the genus Begonia, and many others, on the other hand, the leaves may be chopped up into small bits, each of which has the power, under favourable conditions, of establishing itself as a perfect plant. But this power of reproduction from the leaves alone is given only to comparatively few classes of plants, and such as have it are outside the line of the forester's walk in general. The more woody and arborescent the plant may be, it is generally found that the process of reproduction by cuttings becomes more difficult. In a general way, also, the more dense and hard the texture of the wood of any subject is, the difficulty is correspondingly increased.

The first process that takes place after a cutting is made and planted is the formation of a callus, or a ring of granular matter at its base. Without this there can be no production of root fibres. This callus is elaborated from the true sap, that which is descending from the upper extremities, and is charged with matter in the right chemical condition to repair waste, heal wounds, and add to the structure of the plant. It cannot be formed by the sap in flow, that is, the ascending sap. Yet this idea is conveyed by many who write and have written on the subject, especially in giving directions respecting the proper time to select and make cuttings. The crude sap drawn direct from the soil cannot of itself contribute to the formation of roots or any other organ, till it is chemically changed by the action of the constituents of the atmosphere, which change takes place chiefly in the leaves, but also more or less in every herbaceous part of the plant. It is only at or near the end of the season of growth that this process of elaboration is perfected; and it is only therefore then in a general way—with regard to woody or hard-wooded plants—that the work of propagation by cuttings may properly be engaged in; but the sooner thereafter they are made and planted, the greater are the chances of success. This consideration is of the utmost importance, and it applies more generally and with greater force to deciduous than to evergreen trees and shrubs. Many of the latter class may indeed be propagated from very immature or partially ripened cuttings, if they are protected from the exhausting effects of the atmosphere by means of glass, and are shaded from the direct rays of the sun. But cuttings of deciduous trees and shrubs as a rule, except they are ripe and contain a full amount of fully elaborated true sap, will die under the experiment, no matter what precautions may be taken to prevent that result. I have run the risk of being tedious over this point, rather than be misunderstood by the inexperienced, for whom these papers are intended, as it has the most important bearing on the proper choice of cuttings and the time when production by this means may be most successfully prosecuted.

Respecting the choice of cuttings, having in the preceding paragraph endeavoured to impress on my readers the necessity that they should be ripe, or at least in that stage of maturity in which they contain in abundance the matter without which they cannot develop roots, it is only further requisite on this point to indicate several other important particulars, observation of which will contribute to success.

As a rule, side shoots are superior to leading ones, because they are usually more solid or firm and short-jointed. The best are those which from their position have enjoyed the largest amount of light throughout the season; hence the recommendation which we often see in books, that they should be selected from the lowest branches, or those that sweep the ground, is not always to be relied upon, because such branches are always more or less overshadowed by those above them, resulting in flabby foliage and weak, ill-conditioned wood. There can be no rule laid down for the length of cuttings that would be applicable to those of all kinds of trees and shrubs. But if there is no stem required to stand above ground, as in the case of gooseberry and currant, cuttings, any length from six to nine inches, may be deemed generally convenient. Much stress is laid by some on the desirability of having a small portion of the older wood attached to the base of each cutting ; but provided the young wood is thoroughly hard and ripe, I have never been able to convince myself that it was of much importance, in so far as deciduous cuttings are concerned. Hollow-stemmed subjects, such as the honeysuckles and Lycesteria, are, however, exceptions, which may or should be selected with a base of the two-year-old wood attached, because the older wood is more solid, and consequently less liable to be injured by accumulations of moisture in the tube.

Evergreen cuttings, such as those of coniferæ generally, hollies, and arbutus, should always be selected with a heel or small section of the old wood at the base. Laurels and other easily increased evergreens may be selected with or without such a heel as is found most convenient. All coniferæ and other evergreens that are naturally of pyramidal habit must be selected with perfect terminal buds or leaders, otherwise it will be difficult to re-establish them, and care should be taken to avoid injury to the leading buds either in the making or the planting of them.

In the making of cuttings it is a sound rule to square the base clean and smooth over close to a bud or joint with a sharp knife. It is far from essential or necessary, I admit, to do so in every case. There are some subjects with which the forester has ordinarily to deal that will strike roots from any part of the stem freely, even without incision of any kind, if they are merely stuck into the ground right or wrong end up. The willow and the poplar are familiar examples of this accommodating description, but they are comparatively few, and will succeed none the worse that they are treated according to the rule laid down. Deciduous cuttings, and diffuse or bushy-growing evergreens, may have their central buds cut out or not according to circumstances.

The subsequent treatment of cuttings begins with the necessity of preventing their exposure for any length of time to the atmosphere after they are made. Neglect of this is often the cause of very serious failure. If they cannot be at once planted in the beds or positions they are finally to occupy, let them be tied together according to their sorts in small bundles, and covered up in soil or sand or sawdust, and kept moist till convenience permits of their being planted. Evergreens suffer most from exposure, and should be the more promptly attended to. All the more easily propagated sorts may be planted in any well-sheltered border or plot, where they will not be exposed to cold dry winds in spring, or to the sun during the meridian hours. It is essential that the ground should be light and well drained; if not light enough, it should be made so by means of a liberal allowance of sand being intermixed with it near the root or butt-ends of the cuttings. They should be planted by means of the spade in lines in the same way as any other kind of small nursery stock, and thickly enough to economize space, yet with sufficient room to enable them to stand undisturbed till they are fully rooted. Make them thoroughly firm in the process of planting to prevent drought reaching their butts, and plant them so that in the case of deciduous subjects there may be very little of the top visible above ground, and of evergreens only the portion of the stem having leaves attached to it. As soon as they are planted it is well to give them a slight sprinkling over with bracken, or with light stable litter, the former being the best, to protect them alike from frost and from drying winds; this covering should be allowed to remain over them till all danger of their suffering from either contingency is past.

Coniferæ and holly cuttings must have protection of some kind from the exhausting effects of the atmosphere. They will not endure the alternations of heat and cold and drought and wet which are inseparable from unmitigated exposure. In well-appointed nurseries, where these things are reared by thousands, there is usually a properly constructed propagating house, with heating apparatus attached, so that a little heat may be applied at will for the purpose of driving off excessive moisture, and finally, after the cuttings are well callused, to assist them in the process of rooting. But though essential to the highest success, this can be dispensed with when only small quantities are required of each sort. There are many expedients and appliances suitable for moderate operations. Hand-glasses and cold frames are excellent in their way, when placed in a suitable position, which in order to be so should be dry, and with an aspect on which the sun cannot fall during the hottest hours of the day. The frame or handlight should be filled with a suitable compost, light, sandy, and level, so that it may take water equally all over, and it should be beaten firm with a spade or brick before planting. I have found cocoa-nut fibre refuse mixed with sand the best material for this class of cuttings, and for many things that are much more difficult to do. Its equable retention of moisture and temperature, and its eminently friable condition, along with its cleanness and freedom from fungoid developments, even when it is undergoing decomposition, render it the most favourable medium in which to root cuttings which take some considerable time in the process. The frame or handlight will require to be kept close during the first few months after the cuttings are planted, merely opening them occasionally during the mornings of fine days to let off superfluous moisture. They must be protected from frost, and in spring and summer from hot sunlight, and they must be watered as often as they appear to require it, bearing in mind that drought is the greatest obstacle to success. Dead leaves and damp cuttings should never be allowed to accumulate, and the first signs of damping or fogging, which may appear among cuttings of small coniferæ, such as Retinosporas and Biotas, should be promptly arrested by the removal of the affected parts and a change of treatment. This disorder is caused by stagnation of atmosphere and superabundance of moisture, and a little more liberal ventilation and a more sparing use of the watering-pot overhead will quickly arrest it.

THE USES OF THE THICKET.

A THICKET is a mass of wood, generally young wood, growing so close together that the individual trees are hampered in their sideward extension. The only kind of thicket requiring mention in systematic forestry occurs in young woods aging between ten and about thirty years. This restricted sense will be adopted in the following remarks. By the term thicket we shall accordingly understand a stage in the progress of young woods in which the branches of neighbouring trees overlap one another and interlace.

Some readers will probably not agree with the view that the thicket is very useful in the rearing of timber. It may, however, be reasonably argued that all young woods ought to be allowed to pass through the thicket stage—that the thicket is indispensable in economic forestry. In support of this proposition, three special uses of the thicket will be advanced.

But first let us glance briefly at some alternative methods for checking the side growth of trees and preventing them running too much to branches. These are chiefly artificial pruning with a sharp instrument, and the ingenious device of disbudding with the fingers. These methods seem to give complete satisfaction to many foresters and proprietors in Britain, so much so that they have completely lost sight of the cultural advantages of the thicket. But, even if thorough pruning and disbudding could thoroughly discharge all the cultural functions of the thicket, it would still be a question requiring demonstration, how these methods are to be applied on a large scale.

It cannot be too often repeated that forestry—economic forestry—must work on a large scale and with the utmost economy. Any method which will not satisfy the test of application on a large scale—say in a forest of about five thousand acres—does not belong properly to economic forestry. Disbudding and careful pruning may be very applicable to the woods around a mansion-house; but even there, will they not be more thoroughly applied to the trees along the outer margins of plantations and to trees in the immediate vicinity of the house? There is the further danger in spending such labour on young trees, that some of the work may be lost. How are we to know that any particular young tree will not be cut down in a year or two, at the next thinning? Suppose for the sake of argument that we have just thinned and have to prune ten acres of young wood. It may very well happen that the next thinning will remove three thousand of these young trees in five years' time. Now, if we go carefully over every tree on this area, pruning them and pinching off the surplus of buds, will not the labour on these three thousand young trees be completely lost? Has it not been suggested even that every young tree ought to be pruned or disbudded every year? How is this labour to be overtaken on any scale which is only moderately extensive?

On the other hand, natural pruning by means of a thicket is neither expensive nor laborious. The positive advantages, too, resulting from a thicket are manifold, such as the destruction of grass, heather, and weeds, the exclusion of the sun and the wind; but passing by such as these, our attention must be confined to three only in this connection. These three advantages are—(1) the promotion of upward growth and the growth of the stems (*drawing up*), (2) the atrophy and destruction of the lower branches (*natural pruning*), and (3) the overshadowing and extinction of the weaker individuals among the surplus trees (*natural thinning*).

Drawing up produces tall and straight trees, and promotes the growth of their stems. There is perhaps a danger that in some cases trees may be *drawn up* too much, and that their stems may become too long for their strength and girth. But this danger may be guarded against with ordinary precaution; and in the case of plantations, in which the trees have been started at three feet apart or more, it cannot well occur before twenty years after planting. This danger has in all probability been too much feared in Britain, until it has become an actual bugbear. Anyhow, many foresters plant too widely apart and thin too severely—*Incidit in Scyllam qui vult vitare Charybdin.*

Natural pruning by atrophy of lower branches is economical in every respect, and when it is caused to commence at an early age, it is more effectual than any sharp instrument in giving trees a desirable form and habit of growth. Where young trees are about three feet apart, all the lower branches, as soon as they come to be about two feet long or even less, begin to suffer from contact with neighbouring ones, and to be kept in check. Then, when the branches above join and quite intercept the sunlight, these lower branches wither and die, most of them before they have attained the thickness of a quarter-inch. Thus in a young thicket the lower branches are so small when they wither that they do not create appreciable faults in the timber.

Finally, a few remarks may be made about natural thinning, which is the third advantage to be considered here. In a thicket the trees are crowded, and they cannot all continue to develop themselves and survive. Some trees will be outstripped in the race and deprived of their indispensable sunlight. These will wither up like the lower branches of all the other trees and be overshadowed and choked. The advantage is, that nature thus points out how many and which trees can still thrive on the ground. It will be the worst trees, as a rule, that will succumb in the struggle for existence—those acidentally injured or those wanting in vigour, but most especially those trees which have fallen on the inferior patches of the soil. S. G.

JUDAS TREE (CERCIS).

THIS is a genus of low-growing, ornamental flowering, deciduous trees. Two species only are known in our gardens. One—*C. siliquastrum*, a native of the south of Europe—is one of the most ornamental of hardy flowering trees. The flowers are bright purple-red, and are crowded thickly on the year-old wood, and appear somewhat in advance of the leaves. They have a fine piquancy of flavour when eaten, which renders them a popular ingredient in salads in parts of the Continent where the tree abounds. The leaves are striking and somewhat characteristic in shape, being kidney-shaped, with a heart-formed base, and are a very beautiful pale green when they unfold. The wood is very beautiful, being veined black and green, and takes a fine polish ; it is said also to be very durable, but the growth is so slow that it can only be available for ornamental purposes, for which, however, it is highly useful, although apparently not much employed. This species bears also the popular names, *Red Bud* and *Love Tree*. Why it is called Judas Tree does not appear to be very clear. Gerarde, to be sure, says, " this is the tree whereon Judas did hang himselfe ; and not on the elder-tree, as it is said." But as higher authorities than Gerarde appear to differ as to whether the arch-traitor died by hanging or by other means, we shall leave the question where it is—in unsolved obscurity—merely remarking that it is a pity so hateful a name should be associated with so beautiful an object as this lovely tree. The other species—*C. Canadensis*, a native of Canada, as its name implies—is also a beautiful tree, flowering in the same manner as the European species. The flowers are highly appreciated by the Canadians in salads, and are also pickled by them, in which form they are said to be very delicate and toothsome. The wood of this species is similar in all respects to that of the European one, and the young twigs are used in dying wool, and yield a beautiful nankeen colour.

Both species are worthy of a larger share of popular favour than they receive, on account of their beautiful effect in ornamental plantations and shrubberies.

VALUE OF UNDERWOOD.

THE season for disposing of underwood has again arrived. The produce is of considerable importance, but does not receive the attention it deserves. In many parts of Scotland, says a writer in the *Timber Trades' Journal*, underwood is considered an incumbrance, and instead of being utilized as a source of profit, the most effectual means are often adopted for destroying it. In the north of England the same remark applies, where underwood is never encouraged, except where it is required as cover for game. Foresters of considerable experience on first coming to the south of England are consequently prejudiced, and look with great disdain upon valuable crops of underwood. Several cases have come under my own observation where the owner of large woods has been seriously advised to grub and destroy the underwood stems, on the plea that an undergrowth damaged the valuable timber, by preventing a free circulation of air amongst the trees. Where this advice is withheld the forester often declares his antipathy for this crop by leaving it to take care of itself, and thus eventually the underwood is destroyed, or at least soon deteriorates until it is hardly worth maintaining. Within the last ten years underwood has deteriorated very considerably in value. Several causes have assisted to bring about this result. First, there is the great question of labour, which is in this, as in most other cases, a powerful factor in regulating the value of this crop. Within the last ten years the amount actually paid in wages has not materially increased, but the amount of labour performed has so much diminished as to make the expense of converting an acre of wood about 35s. more than in 1874. Then there is the depreciation in the value of hoops, rakeware, hurdles, sheep cages, and hop poles, all of which tend still in the same unremunerative direction. Another powerful factor is the conversion of firewood grates and hearths into stoves and kitchen ranges only adapted for burning coal. Ten years ago a kitchen range in a cottage was the exception, and the cottagers never saw coal except at Christmas, when the distribution of a half-hundredweight to each household was kindly attended to by the squire's bailiff. Now every cottage is supplied with a kitchen range, and the "ingle-nooks," where the tired "gudeman" enjoyed his pipe while watching the flames and sparks emitted from his blazing wood, are things of the past. Instead of the blazing hearth and cosy seat in the corner, he has his chair drawn close up to the half-burnt coal in the grate. Ten years ago all the bakers' ovens in the south of England were specially constructed for burning wood. Now an oven of this description is the exception, and for one fagot now consumed in baking bread, at least 1000 were previously used for this purpose.

All these causes combined have very seriously reduced the value of our underwoods, but there is still another cause which has been more powerful than all these put together, and that has been neglect or bad management. The underwood is often cut in the most slovenly manner. Instead of the stems being cut clean from the stub they are hacked and split in the most unworkmanlike manner. The produce is removed by carting through the stubs instead of being carried off and placed by the sides of roads. The open ditches for carrying off surface water are neglected, and the "blanks," which are often very numerous and very large, are neither filled up with young plants nor with splashers. Ten years ago, alder underwood of nine years' growth was sold in Hants for £27 per acre, the purchaser paying all expenses of cutter, converting, etc. The same piece of underwood sold last year for £19 per acre, and the purchaser, who is one of the largest rake manufacturers in the south, lost £2, 15s. per acre upon the purchase. Ten years ago hazel underwood of ten years' growth, suitable for making hurdles and sheep cages, sold for £9 per acre. This year the same description of underwood will not realize more than £6, 10s. Ten years ago, mixed wood, principally under large timber trees, fit only for bakers' ovens, was sold for £4, 15s. per acre. This year the same description of wood will probably realize £3, 5s. In consequence of the general depreciation of all descriptions of underwood, this crop has been still further reduced in value by careless management. In North Hants a piece of ash and chestnut underwood was sold eight years ago for £23 per acre for eight years' growth. The young shoots were afterwards so severely gnawed by rabbits each succeeding winter, that the crop is almost entirely destroyed. An alder gully upon the same estate was sold for £19 per acre for nine years' growth. This gully should be sold again this year, but the wood is not large enough for either rake or brushware, and it will have to stand two more years before it is worth £8 per acre.

In Surrey and Sussex alder underwood has to be almost exclusively used for powder-making. For this purpose a full crop of seven years' growth will realize about £9 per acre after deducting expenses. The demand, however, for alder has now ceased, and our best powder-makers prefer dogwood and willow. Large quantities of dogwood are sent from Norway and Sweden for this purpose. In our gullies willow is being substituted for alder, which will certainly be a more remunerative crop for damp, low-lying situations. It will be ready to cut at least two years sooner than alder, and will produce a heavier weight of charcoal wood per acre in the shorter time.

It will not suffer from late spring frosts destroying the tender shoots, and thus making it coarse and jointy; and consequently will realize more money at five years' growth than an alder gully will do at seven. Willow "splashers" strike well into the soil the first season, so that vacant spaces can be successfully filled up with them.—*The Garden.*

INFLUENCE OF FORESTS UPON THE FLOW OF STREAMS AND UPON FLOODS AND DROUGHTS.*

WHATEVER doubt there may be as to the direct influence of forests in the production of rain, there can be none in regard to their effect upon the distribution of the rainfall by means of springs and streams. The responses received during the year to the inquiries on this subject made by this division, confirm the conclusions arrived at by observations and inquiries which have been made from time to time in this and other countries. With one voice they attest the fact that the removal of the forests from the neighbourhood of streams not only lessens the whole amount of water flowing in their channels, but renders its flow much more irregular than before. In the case of the smaller streams, where the forests adjacent to them, or in which they have their head-springs, have been cut off, the streams have often been so reduced as, at certain seasons of the year, almost to disappear. And, in the case of streams, whether large or small, the result has been to produce floods when the snows melt in spring-time, or after heavy rains, to be followed by a greatly diminished flow of water afterwards, especially in those seasons of the year when rains are least frequent and copious.

As to the direct influence of forests in producing rain or increasing its amount in their immediate vicinity, and their consequent favourable effect upon agriculture and the supply of water for springs and streams, although the preponderance of evidence at present seems to favour the conclusion that they have such an influence, further observation and careful and extended experiment are necessary before this can be considered definitely and conclusively settled.

Hardly anything, however, can be regarded as being better settled, by extended observation, than that the forests are great regulators of the distribution of the water precipitated from the clouds, and consequently of the flow of streams. By their shade and by the obstruction which they offer to sweeping winds, they lessen the evaporation which would otherwise carry off speedily from the ground much of the rainfall, while the loose, spongy soil, formed by the accumulation of their fallen leaves, absorbs the water precipitated from the sky or produced by the melting of the winter's snow, and causes it to flow off gradually into the channels of the streams, instead of being allowed to flood them at once, and produce at times devastating torrents. It is a well-established fact, obvious to all whose observation reaches through any considerable period of time, that with the clearing away of the forests to secure land for agricultural purposes or to convert them into lumber, the lesser streams have diminished in volume, and the larger streams for this reason have become less navigable, and therefore less available for commerce. Instances might be adduced without difficulty of saw-mills and other wood-working establishments, which have been erected upon streams flowing through or near forests, with the design of using the material near at hand, where the process of cutting away the trees has so diminished the amount of water that the requisite power has failed, and the owners have been compelled to build new dams and duplicate their machinery so as to use the diminished water-supply a second time as the only means of continuing their business. The manufactures on many of our streams have been obliged thus to duplicate their machinery, or to build reservoirs at great cost, in which to store up the superabundant water of flood-times for use in times of drought, or to supplement their deficient water-power by the introduction of the auxiliary power of steam.

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* From Report of Commissioner of Agriculture, U.S.A.

Four years ago the State of New Hampshire appointed an able Commission to inquire into the extent to which the forests of the State were being destroyed, and the effect produced by their destruction upon rainfall, ponds, and streams. This Commission, after protracted and extensive inquiry, has recently made its report, which is one of great value, not only for the people of New Hampshire, but for those of many other States. For the purpose of ascertaining the facts of the case, the Commission sent out circulars to the town authorities and to many others, especially of the older inhabitants, asking them whether the amount of water in the streams, ponds, and springs in their vicinity had diminished within their remembrance; and, if so, whether the removal of the woods and forests had anything to do with it. From the replies to these circulars, it is very clear that the destruction of the forests has had serious effects. Among the facts reported, the following may be taken as examples of the general testimony: A small stream in the southern part of the State, in the town of Richmond, in 1865, furnished power sufficient for four sawmills nearly all the year. It began to dry up as the cutting of the timber commenced in its vicinity, and the water and the woods now have disappeared together. In the adjoining towns of Fitzwilliam and Rindge, the same results have been reached. Well-known trout-streams, once well stocked with fish, are now dry one-half of the year, the ground having become treeless. In Chesterfield the flow of the streams is reported as more irregular than in early times. The same is true of the streams about Nashua. The Merrimac River, so important for manufacturing purposes, is protected from great variations in its volume from month to month by means of large ponds and dams, but one of the oldest inhabitants of Franklin, who has observed the river for sixty years, thinks its volume has diminished one-fourth in that period. One who has given much attention to the subject is confident that the water in the Contoocook River has decreased one-third, even within twenty years, and that its tributaries have fallen off still more. At Hanover, it is said, the Connecticut River for many years has been decreasing in volume, and with increasing rapidity the timber from its headwaters has been floating by. In Canaan, sixty-five years ago, there were nine or more mills; abundant water-power all the year round; no thought of reservoirs, double dams, or precautions against drought. A native of the place, returning after an absence of thirty years, found the hills and rocks bare, the springs choked up, and the mills obliged to resort to steam-power or to lie idle. Even in the northern counties, where the timber is still comparatively abundant, similar testimony is given. In the town of Littleton, three of its oldest citizens testify that the power of the Ammonoosuc at that point has diminished one-third within fifty or sixty years. An intelligent observer at Berlin, on the Androscoggin, says that the water in eight brooks and two ponds in his vicinity has materially diminished within twenty-six years. Six years ago he supplied his stock with water from what was then an unfailing brook, by means of an aqueduct, which furnished three hundred gallons per hour. Now that the trees along the stream have been destroyed by the woodman's axe and by forest fires, his water-supply is cut short in summer by drought and in winter by frost.

The geological character of New Hampshire is such that it must continue largely a wood and timber bearing State. "Nature herself," say the Commissioners, "in the very configuration of the State's surface, and in the character of its soil, absolutely commands that whatever may be the preference of its inhabitants, at least one-half of it shall remain perpetually devoted to the production of wood and timber, and that what nature has unalterably ordained it becomes them to accept." Accepting this ordinance of nature, the wooded area, in limited districts, has been allowed to increase, and in every instance where the decrease of water-power has been checked or averted, the Commissioners say that it has been by means of the preservation or restoration of the forests. The regulative power of forests receives important testimony in its favour also from the geological report of the State, from which we have the statement (vol. i. p. 124), that when in the central and southern portions of the State the hay crop has been cut short by drought, it has been known to be above the average in the northern part, even with less rainfall, and for the reason that the forests secured a better distribution of the results of rainfall and melted snow. In short, the proper storage and distribution of our water-supply are of much greater importance to us than the amount received.

THE SILVER TREE.

FORMERLY it was supposed that the silver tree—known to botanists as *Leucadendron argenteum*, and whose leaves are now so much used for decorative purposes—was restricted to the Table Mountain; but recent explorations have led to its discovery in several localities in the Drakensteenberg, lying from 50 to 60 miles distant; still there is not the same certainty that the silver tree is really indigenous in these localities, as there is that the glory of the Table Mountain, *Disa grandiflora*, which also was believed to be peculiar to Table Mountain, is so in the Cedar Mountains in the Clanwilliam district, much farther away.

The silver tree is in every way such a distinct tree, so different in aspect from all its congeners, and so striking an object in the limited district where it is at all common, that any new particulars concerning it are generally interesting.

Dr. R. Marloth contributes an article on this subject to the current part of Engler's *Botanische Jahrbücher*, in which he briefly sketches the history and distribution of this remarkable tree, which, it may be mentioned in passing, is well illustrated in the "North" Gallery at Kew. It appears that it has been observed by Mr. H. Bolus, the most accomplished of South African amateur botanists, on the Heldenberg, by Dr. P. D. Hahn on the Schaapenberg, and by the Rev. Mr. Faure on Simonsberg. Discussing the probabilities of the silver tree being indigenous or planted in these localities, which lie some miles apart, Dr. Marloth thinks they favour the assumption that the former is the case. Certainly they have not been planted within a considerable period, for nobody in the neighbourhood of those places knows anything about them. That they were planted in earlier times during the Dutch occupation he holds to be very unlikely, because planting was then limited to avenues of European oaks and a few groves of pines. He also urges that the intervening sandy plain of some 20 miles in breadth is a sufficient obstacle to have prevented modern migration. Of course no opinion worthy of consideration could be hazarded on the foregoing points without a complete knowledge of the early history of the settlement of the country and a thorough acquaintance with its topography; but we have the testimony of the accurate and observant Burchell that the silver tree was planted to some considerable extent as long or longer ago than the beginning of the present century. In his *Travels* (vol. i. p. 61) is the following passage relating thereto, premising that it was in the year 1811:—"Neither of us being acquainted with the proper road to Constantia, we missed it, and wandered till we came to a very pretty farmhouse, where, on inquiring our way of two women, we received an answer in good English. They informed us that the place belonged to Mr. Duckett, an English agriculturist, who has for many years resided in the colony, and whose knowledge of European husbandry has enabled him to manage a Cape farm with considerable success; he is one of the small number of English colonists who were at this time to be met with in the country. This place is called Witteboom, a name which, with great propriety, it has received on account of numerous plantations of large Witteboom, or silver trees, which grow about it. The native station of this handsome tree is the sloping ground at the foot of the eastern side of Table Mountain; and at present very large plantations occupy the same situation on the northern side, next to the town. That this space should be the only part in all the colony where it grows wild can be no subject of wonder to any person who has the least knowledge of Cape botany, since the natural places of growth of a multitude of other plants are circumscribed by limits equally contracted."

Here, then, is irrefragable evidence that the silver tree was extensively planted long ago in the peninsula, if not elsewhere. From his route map it would appear that Burchell just missed the localities in the Drakensteenberg cited above; therefore, although he is silent on the subject, the silver tree may have existed there in those days. Yet it is surprising that it should have been so long overlooked or disregarded in so accessible a part of the country.

With regard to the cultivation of the silver tree, Dr. Marloth states it only grows in a soil strongly impregnated with decomposed granite. He nowhere met with it in sandy or slaty soil, and repeated attempts to cultivate the tree in and around Cape Town have, it is said, failed.

With regard to natural means of dispersion, the silver tree exhibits a very singular adaptation of the withered perianth, which doubtless assists in conveying the seeds short distances, at all events. Miss North's painting shows some plumed bodies floating away from the opened cones, which puzzled us much until we had examined herbarium specimens, and ascertained what they were. The strongly-bearded or plumose, four-lobed, finally scarious perianth breaks away from the base of the light, one-seeded nut, the lobes still cohering by their tips, and forming an orifice through which the persistent capitate style does not slip. When the fruit is quite ripe and the weather dry and sunny, the four lobes of the perianth spread outwards from below, and the winds carry them away, bearing the seed-vessel hanging by the tip of the style; the withered perianth thus forming, as Dr. Marloth observes, an admirable breakfall. Such a contrivance or provision is unique so far as we know, but of course much remains to be learnt in this direction.

In habit of growth the silver tree bears some resemblance to a stout pine or araucaria, and the cone-like aggregation of the seed-vessel adds to the likeness. It is, however, of comparatively small stature, not exceeding 40 feet in height, even in the most favourable situations. The male and female flowers of all the species of *Leucadendron*, and the allied South African genus, *Aulax*, are borne on different plants, and in consequence of the cones being persistent, the females are readily distinguished from the males. This is very striking in *Leucadendron platyspermum*, an expanse of which is represented in one of Miss North's paintings.

The silvery, soft, downy leaves of the silver tree are crowded, and lie almost flat on the branches, like slates on a roof, each leaf partly covering several others. This down is so dense that it is easy to write or paint upon it when the leaves have been dried; and leaves thus manipulated are among the first curiosities sent home by Europeans arriving at the Cape.—*W. B. H. in "Gardeners' Chronicle."*

HOW LUMBERING IS CARRIED ON.*

LITTLE is known of the labour expended on a common deal board before it finds its way into some article of domestic use. To illustrate the toil expended on this great staple, though lightly treated, article, the following sketch of lumbering and operations in the woods by the lumbermen from whose hands it first comes may prove interesting. The latter are a race of men peculiar to Canada, Maine, and the Far West, and it is in the depth of winter that their work in the woods is carried on, felling the huge pines which have been previously marked by persons sent out to explore the various timber limits leased by the millowners from Government, preparatory to making them into square timber or saw logs. Five kinds of hands are necessary for the woods—the foreman, the hewer, the liner, the scorer, the road-cutter, and the cook. An ordinary shanty crew of two gangs of timber makers, sufficient to get out a raft of 80,000 feet of timber, would consist of a foreman, two hewers, two liners, four scorers, four road-cutters, one cook, and a teamster and crutchman. The provisions for a shanty are generally taken up in the previous spring, before sleighing breaks up, as the majority of the timber districts are inaccessible to waggons. The shanty is a rudely built log cabin, with bunks or sleeping places ranged round in tiers, with a huge raised hearth in the centre that throws out an immense heat from the logs that roar and crackle on it, and whose smoke escapes through an opening in the roof a little smaller than the hearth below.

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* From *Canadian Forests.*

Before commencing to make the square timber, the men are divided by the foreman into separate groups, each gang consisting of one hewer, one liner, and two scorers; the road-cutters, who have to clear a way to the stream or river, and cut out the underbrush, are independent of the timber makers, and their number depends on the description of the country worked, as they have to clear roads to the timber made. The duty of the foreman is to search for the locality of the timber, and to point it out to the liners; to select the main road to the river by the shortest and most level route; to locate the site for the shanty in the fall; to see that each man is daily at his work, that the necessary amount of timber is made, and that it is sound and wholesome to suit the market. A return of the quantity cut is given in by the liner every week to the foreman. The teamster and crutchman next come into use, the latter so called from the description of sleigh he uses, which is merely the crutch of a birch tree fashioned into a sleigh. The stick of timber is chained on this, and drawn by the team to the rollway, which consists of a large space sixty or more feet square, cleared free from trees and brush. In this is laid a large tree which has been felled, and the bark taken off the upper side, to allow the timber to slide over it easily, on which from twenty to thirty sticks of timber are drawn and laid across so as to remain nicely balanced, with the end of the stick some few feet up. This is for the purpose of allowing the teamsters to drive up to the rollway, back their sleighs under, and by the slightest touch the stick is brought down on the sleigh and chained, and away goes the teamster with his load to the river without any trouble in loading. In the middle of December preparations are made for the reception of the teams, consisting of the building of stables and granaries. Teams are hired at so much per day for self (teamster) and horses, free of all expenses—that is, food for the driver and grain for the horses; price varying from 1 dol. to 2 dols., like all other commodities, regulated by supply and demand. These teams are loaded with provisions, produce and other necessary supplies for the use of the trade at the shanty, and are started off generally at the beginning of January to their destination. Arrived there, their loads thrown off, their sleighs are arranged for drawing timber by making and fixing on a "bunk," that is, a piece of hardwood some ten inches square and three feet long, fixing it on the middle beam of the sleigh, to allow the end of the stick of timber to rest on it some four feet from the end, the other trailing on the road, and hauled in that way. As to the number of teams required in a shanty, that depends on the distance the timber has to be drawn, some roads being only a mile from the river, whilst others, again, may be eight miles and sometimes longer. If, instead of square timber, saw logs are being cut, they are hauled over cliffs and down ravines to the banks of the various tributaries of the principal rivers, where, before the thaw sets in, millions of cubic feet of timber are collected. When the ice-bound streams are free in spring the arduous and dangerous work begins, for then a new feature of lumbering comes into operation. Loosely joined together in rough rafts, the logs are set adrift in the rivers, swollen fiercely with waters from the melting snow. In New Brunswick some of these rafts of logs cover a space of ten acres, and if by accident the raft breaks up on a rapid, the logs may get wedged and bound together on a ledge or shallow, stopping all the miles of logs following, and causing a "jam." The obstructing logs which cause this must be cut away or extricated. Only the bravest, coolest, and most experienced of the lumberers can attempt the cutting out of a log, the most dangerous of all their tasks; for when once the log which bars the passage is half cut through, the might of the press behind breaks them like straws, and some ten thousand logs come plunging down with a rush and confusion, requiring all the activity a man possesses to escape the avalanche. Chopping away a jam is only resorted to when other measures fail. The more simple way of removing the obstacle is as follows: The men are brought to the vicinity of the jam on the shore, and the foreman or man in charge of the drive, with some half-dozen of the most active and experienced, go out to this jam in a boat and examine it, and conclude among themselves the most suitable place to commence at clearing the river. If handled with judgment, a few hours will sometimes start the whole, whereas, on the other hand, days may elapse before it is all away. The plan is to use what is termed a jam-dog, to which is attached a strong rope. The man on the jam catches the dog in the stick he wishes moved, and all hands on shore pull on the rope, and draw the stick into the stream. When the key stick of the jam starts, then it becomes dangerous. The men on the jam start for the boat before the timber forming the jam gets well rolling, and make for shore, and it is necessary then that they have cool presence of mind and good use of their legs, as one false step till they reach the boat would be almost certain death. The jam off, the driving in boats continues until the next rapid is reached, and a repetition of the same plan is followed. In driving timber through a lake where a good current exists in the middle of the stream, the timber that may have worked or been blown into the numerous bays with which they generally abound is towed out to the current by the boats' crews and allowed to drift down; but where the current is too sluggish, kedging is adopted to cross the lake and reach the swift water. Where slides for single pieces of timber exist, the timber is retained at the head of the slide by a boom placed for that purpose, so that, when all the timber has arrived in it, they open the gap, and commence feeding through the slide, piece by piece, as fast as the nature of the slide will admit of.

THE MAPLES OF CANADA.

THE maple (*Acer*), whose leaf is the emblem of Canada, as the rose is of England, contains several species, but a similarity pervades all, so that the description applies to them collectively. It is a lofty tree, with branches nearly at right angles, bent and contorted in every direction. It grows on the best of land, and is always indicative of a rich soil. Its foliage is particularly luxuriant, and when touched by the frosts of autumn is remarkable for its brilliancy of colouring. The wood of the maple is very close-grained and hard, highly ornamental and esteemed for the beauty of its fibre; when polished it possesses a silky lustre. Strong and heavy, it lacks durability, and from its early decay when exposed to moisture it is not sought after in civil or naval architecture. It is used for heavy furniture, cabinet-work, and for railway carriages where strength is required. A peculiar arrangement of fibre in some specimens, in concentric circles, resembling the eye of a bird, has given the name "bird's-eye" to such varieties, which make handsome articles of furniture and picture frames, and command a high price. From the sap of several varieties of this tree is manufactured "maple sugar" and syrup, described elsewhere. Maple when obtainable is universally preferred for fuel, from the great heat it throws out. The white maple (*Acer dasycarpum*) is a large tree from 60 to 80 feet high, with a trunk 5 to 6 feet in diameter, common in the east, with wood of little value, soft and white. The striped maple (*A. Pennsylvanicum*), not abundant, seldom attains more than 30 feet in height, with small trunk; wood white, close-grained, and very hard. The red swamp or soft maple (*A. rubrum*) is a large tree generally in swampy and low grounds; wood whitish or rose-coloured, close-grained, moderately hard, and susceptible of a fine polish; largely used in cabinetmaking, for turning and for woodenware. The sugar or rock maple (*A. saccharinum*) grows from 60 to 80 feet high, with a trunk 2 to 4 feet in diameter, and thrives in uplands or rocky ridges; its wood is hard, close-grained, smooth or compact, and is extensively used for flooring, cabinet-work, turning, and preference is given to it for shoe-lasts. Sugar is largely obtained from this species. The mountain maple (*A. spicatum*), a northern species, cited by Professor Macoun, is but little known. The vine maple (*A. circinatum*) of the Pacific coast, a tree 30 to 40 feet high, or at times only a shrub forming dense thickets along streams, whose vine-like stems take root wherever they touch the ground, affords a white, close-grained, tough wood, used in the absence of ash for tool-handles. Dr. Dawson says this tree is never found inland. Another Pacific coast maple (*A. glabrum*) is mentioned by Professor Macoun, but is apparently little known. *A. macrophyllum* of British Columbia attains a height of from 60 to 80 feet, with occasionally a diameter of 4 feet, and like the previous one is confined to the coast; its wood is valuable, hard, close-grained, and takes a good polish, is well adapted for cabinetmaking, and is a good substitute for the hickory of the east; hats, mats, and baskets are made from its inner bark. The ash-leaved maple (*Negundo aceroides*) is abundant in the North-West, but rarer in the Eastern Provinces. It is a tree from 30 to 50 feet high, with a trunk of some 2 feet in diameter, found along river banks and in rich soil. Its wood is soft and of little value, but the tree is destined from its rapid and easy growth to be the shade tree of the prairie farms.

SOCIETIES.

FALKIRK HORTICULTURAL SOCIETY.

THIS Society held its second annual spring flower show in the Town Hall, Falkirk, on the 25th March. There was an excellent display of greenhouse and stove plants from both gardeners, amateurs, and nurserymen, and the show was considered, notwithstanding the untoward character of the winter, a success.

GLASGOW AND WEST OF SCOTLAND HORTICULTURAL SOCIETY.

THE Glasgow and West of Scotland Horticultural Society held its annual spring flower show in the St. Andrew's Hall, Glasgow, on the 24th March. In so far as the gardeners' and nurserymen's classes were concerned, the entries in point of numbers and quality were quite up to the average standard, but there was a perceptible falling off both in quality and quantity exhibited by amateurs, which was doubtless due to the prolonged and severe character of the winter. The principal exhibits from nurserymen were those from Messrs. Austin & M'Aslan, Glasgow, containing choice samples of Japanese maples; Sutherland, Lenzie; and M'Kenzie, Bellfield, Paisley, whose collections were greatly and justly admired.

SCOTTISH HORTICULTURAL ASSOCIATION.

THE ninth annual general meeting was held in the Association's rooms, 5 St. Andrew Square, Edinburgh, on Tuesday, March 2. Mr. W. W. Welsh, of Messrs. Dicksons & Co., Edinburgh, one of the vice-presidents, occupied the chair. The secretary read the annual report, which stated that the various objects of the Association continue to receive the careful attention of the Council, regretting that the want of funds has not yet enabled them to open a reading-room and library; they would earnestly impress on the members and friends of the Association throughout the three kingdoms the necessity of making every effort so as to enable the Council to carry out this desirable object.

During the session nineteen new members have been added to the roll, which has now a membership of 406. The meetings continue to be held within the rooms, 5 St. Andrew Square, on the first Tuesday of each month, at half-past 7 P.M., and are fairly well attended by resident members.

EDINBURGH BOTANICAL SOCIETY.

A MEETING of the Edinburgh Botanical Society was held at 5 St. Andrew Square on 9th March—Professor Dickson presiding. There was a good attendance of members. The first communication was by Dr. J. M. Macfarlane, who dealt with the structure and functional arrangement of the leaves of Darlingtonia. Mr. Symington Grieve contributed observations on the island of Rum, and Dr. William Craig gave an account of the excursion of the Scottish Alpine Botanical Club to Killin and Loch Awe. Mr. R. Lindsay, curator, reported on the temperatures and open-air vegetation at the Royal Botanic Garden, Edinburgh. February, he said, had been extremely wintry, with much snow and uninterrupted low temperature. Vegetation had therefore most fortunately been held well in check. Had it been otherwise, the results would have been much more disastrous than they now found them, particularly when such unusually severe weather had been protracted into the present month. During February the thermometer was at or below the freezing point on 22 mornings, indicating collectively 128 degrees of frost for the month, as compared with 67 degrees for February 1885. The lowest readings were registered on the 3rd, 22 degrees; 4th, 20 degrees; 5th, 16 degrees; 25th, 23 degrees; 27th, 22 degrees. The highest morning readings were on the 8th, 36 degrees; 9th, 40 degrees; 10th, 38 degrees; 12th, 34 degrees; 13th, 39 degrees. The lowest day temperature was 30 degrees, which occurred on the 3rd, and the highest, 50 degrees, on the 13th of the month. Not much direct injury had been done to vegetation by the frost, notwithstanding the large amount experienced. This result was due in great measure to the almost dormant condition in which most outdoor plants still remained, and also to the absence of extremely low readings, 16 degrees being the lowest marking for the month. Since the present month began there had been no improvement in the character of the weather, but the reverse. Besides snowstorms of unusual severity, there had been hard frost every morning without intermission. On the morning of the 7th the glass fell to 13, or 19 degrees of frost, which was the lowest register at the garden for the month of March since 1879, when 3 degrees lower were registered on the 14th March of that year. The total amount for the whole month at that time was 60 degrees of frost, while during the last eleven days 89 degrees of frost had been registered. A report was also submitted from Mr. R. Bullen, of the Royal Botanic Institution, Glasgow. The severe frosts and snowstorms experienced during the month of January were continued, Mr. Bullen said, during the first week of February, 15 degrees of frost having been registered on the night of the 2nd, and 20 degrees on the night of the 3rd—the latter reading being the lowest since the night of the 13th December 1882, when 20 degrees were also registered. An interval of comparatively mild weather was experienced during the second week of the month, since which time frost had been more or less continuous. The night temperature was at or below the freezing point twenty times, giving a total of 124 degrees of frost. The drifting showers of snow and cold winds experienced latterly had had a marked effect on vegetation, fewer hardy plants being in bloom or pushing growth than was usual even after hard winters.

The abstract of accounts of the Society for the session 1884–85 showed receipts amounting to £175, and funds in hand amounting to £230.

FOREST WORK FOR THE MONTH.

ENGLAND.

THE weather of this month is very uncertain and fickle—some days cold, others warm, and followed by frosty nights. The general temperature advances slightly, although subject to great variation. The average rainfall is about 1¾ inches, and the evaporation about 2¼ inches. The recorded rainfall of this month last year was—

At Greenwich, . .	2·04 inches.
„ Clifton, Bristol, . .	2·181 „
„ Colmonell, Ayrshire, .	3·62 „

ORCHARD.—Recently planted fruit-trees should be examined and set firmly in position. Stir the surface of the ground lightly, and work in the soil close to the stems. Do not prune off large branches at this period, as such operations weaken the trees and induce canker.

FENCES.—The planting of live fences should be finished before now. Where such work has not been completed it may still be carried on, but the operation must be conducted with greater care. And where practicable, the roots may be dipped for a short time in a mud puddle before being planted, and copious watering may afterwards be necessary. Hoe and clean weeds from all recently planted hedges, and continue this work as often as necessity demands during the summer.

WOODS AND PLANTATIONS.—We presume all forest planting has been completed, although some evergreens may still be transplanted successfully. Examine the trees in all newly formed plantations, setting upright loose plants, and tramping the soil firmly around the stems. Clear away from growing trees all broken, dead, or decaying branches, and clean up the debris of last season's cuttings from woods and coppices. Finish trimming evergreen shrubs and hedges, and trim up ivy on walls; the fresh foliage will soon cover the nakedness caused by the operation.

NURSERY. — All nursery work requires to be conducted with energy. Transplanting should be speedily finished. All sorts of coniferæ seeds should be sown during the month; in the southern part of the country about the middle of the month, in the northern about a week or ten days later, according to weather and other circumstances. Excess of rain immediately after sowing may destroy the vitality of larch and pine seeds. Protect seed-beds from birds by some efficient covering that, while protecting the seeds, will admit sufficient light and air. Weed the seed-beds of last year. and dig the alleys. Continue digging between the rows of trees, and keep the ground clear of weeds. Young nursery stock is liable to be injured by late frosts, and should be protected in some way. The object is to shade the plants from the morning sun until the frost is gradually dispelled, and this may be attained by twigs of laurel, spruce, or anything else that will sift the sun's rays and prevent the full glare from falling immediately upon the plants.

OAK PEELING.—Oaks for the season's fall should be marked early in the month. In the event of genial weather following the colds of the first half of March, vegetation may advance rapidly, and the oaks be early in season for peeling. In stripping, beat the bark upon the tree as little as possible, as such bruising of the bark deteriorates its quality. In horsing the bark for drying, be careful to keep the inner or fleshy side down, and only expose the rough external surface to the sun and weather; and use the larger pieces to cover the smaller, as a thatching to throw off rain.

A. PATERSON.

PAULTONS, ROMSEY, HAMPSHIRE.

SCOTLAND.

PLANTING.—Any planting that still remains unfinished had better be done at once. According to ancient dictum, no planting should be done later than April, nor sooner than September. In other words, should only be done in those months having in them the letter R, and not in any of those months without said letter.

This is prominently the month of the year in which the forester requires to keep both eyes open. All ligatures, wires, or anything tied round trees should be examined and slackened.

Attention should be paid to all fencing, particularly that done by farmers where trees are growing, to see that no nails or staples are driven into them, and when such is found they should at once be carefully withdrawn, and the offender spoken to about it in a friendly way, and the injury done explained and pointed out so as to prevent a repetition.

FENCES and GATES of all kinds should be examined and put into good repair before the stock is turned out. Inattention to this is often the occasion of much future labour and trouble; for if once animals find their way through fences, they are difficult to restrain afterwards.

As the month advances the sap will flow, and peeling may be done, beginning with the larch, willows, alder, and finally ending with the oak. For all rustic purposes, where the wood is to be used, the sooner the peeling is done the better, both for preserving a fine smooth clean surface before the cambium begins to form, and also for the quality of the bark, which is best when early peeled.

The squirrel must now be strictly watched, and war declared against him. Interesting though they are in all their gambols, movements, and antics, yet they must be killed wheresoever they can be got at, and by whatever means or expense, for they are emphatically next to the rabbit the forester's greatest pest.

All hedge-pruning should be finished forthwith, and any failures not yet made up should be so at once.

Winter-cut timber and wood of all sorts should be collected to the timber-yard or sawmill.

Heath, too, for thatching or other purposes should be cut, bundled, and stacked, dry for future use.

Osiers, or willows, not yet cut should be done at once, and placed in water in the usual way, thereby preparing them for peeling.

Nursery work of all kinds should be kept well in hand, seed-sowing prepared for, grafts looked to, transplanting done, and the endless little things attended to.

Any trees or shrubs broken or overbalanced by the late snowdrifts should be assisted, and the injury repaired as far as possible, and especially broken branches lopped off, and the wounds properly dressed.

C. Y. MICHIE.

CULLEN HOUSE, *27th February* 1886.

LETTERS TO THE EDITOR.

RATING OF FOREST LANDS.

DEAR SIR,—The report in your March number of *Forestry* on the "Rating of Forest Lands" is very interesting. I shall be looking forward for further comments on the same subject, as I find, from my own experience, that the assessments for rates on woodlands are almost always at too high a figure.—Yours faithfully,

FRANK T. HUSSEY.

THE PORTMAN ESTATE OFFICE, THE GROVE,
CHEDDON FITZPAINE, TAUNTON,
11*th March* 1886.

DURABILITY OF OAK SAPWOOD.

SIR,—I note at page 708 of your March number of this journal that Mr. Michie states, "The sapwood of oak cut in winter, *and used with the bark on*, has been known to last two and sometimes three times longer than it does when peeled." I beg to differ from him. I grant that oak felled in winter, from which the bark has been hewn on four sides, before the sap flows, will last not only two or three times longer, but will last sound as long as the heart. I remember the Town Hall at Welshpool, taken down in 1840; this building was said to have been erected about the year 1000, and was therefore 840 years old. The oak beams had portions of bark in many places remaining on them, and the sap was as sound as the heart. When our Government were using large quantities of oak timber for shipbuilding, they used to stipulate that certain classes of oak trees should be "winter-felled," and for which they paid a price sufficient to compensate the merchant for the bark; but these were hewn or sawn before the sap flowed, as it is a well-known fact that, although trees may be felled in winter, a few nice warm sunny days will be sufficient to cause the bark to slip almost as well as if the tree had been left standing. I have had oak trees peeled which have yielded excellent bark two months after they have been felled. If the bark is left on, the sap cannot evaporate, and fermentation takes place, fungus is formed, and I have seen trees with the sap so decayed in the following winter that when the bark was removed you could pinch it out with your thumb and finger.

This rapid decay under bark is manifested in some of our soft woods. Alder and birch are worthless if left lying on the ground, unless the bark is properly chipped off the whole length of the tree.

Wm. Mainwaring.

Bainfield, 11*th March* 1886.

SPANISH CHESTNUT.

Sir,—I am surprised to see Mr. Blashill's remarks about the durability of Spanish chestnut. Some twenty years ago a Liverpool timber merchant called on a matter of business. In the course of our conversation the subject of Spanish chestnut came up. My friend told me that Chester Cathedral had been under repair, and that he had taken the opportunity of looking over the building; he found that the roof was being partially renewed, the defective portion was English oak, whilst the sound part was Spanish chestnut. I suggested that the chestnut, in all probability, was of more recent date than the oak, but he stated his belief that both parts were coeval, and in this opinion the workmen concurred. I have always considered the Spanish chestnut, when free from shakes, to be equal to oak for durability, and the wood is much easier to work. My informant was Mr. John Griffiths, English timber merchant, Liverpool.

W. M.

SHOULD NEWLY-CLEARED FOREST BE AT ONCE REPLANTED?

Sir,—Having cleared about 30 acres of a rather thin plantation of mixed hardwoods, which had stood for about fifty years, and being anxious to replant immediately, I would be glad of your advice on the matter. I am told by some that I should not plant the same kinds of trees again, but rather firs, such as larch, and spruce or Scotch, while others say it may be planted with the same kinds as those which have just been removed. Another set of advisers hold that it should be allowed to lie unoccupied for three years at least before being again planted. I am afraid that in the multitude of counsellors in my case, while there may be wisdom, I may fail to perceive in which direction it lies. I therefore appeal to your judgment on a point of some importance to me. With apologies for troubling you with such a matter, I remain, yours faithfully,

SYLVA.

P.S.—I should perhaps mention that the soil is a good loam, and though in some parts rather moist, could not be called wet, and that the aspect is eastern, inclining to south.

[The question as to whether land newly cleared of timber should be immediately replanted is one on which authorities differ somewhat. There are those who say it would be an error to do so, as the land is believed by them to be exhausted and unfit to carry another crop of the same kind, that is, timber of any sort; and that it should undergo a course of fallow or rest of three or four years. The argument is plausible, but is not supported by experience. The assumption that the land is exhausted is gratuitous, or at best based on erroneous ideas as to the necessity of rotation in the case of timber crops. The case of natural forests need only be instanced to show the fallacy of such a belief. In these the work of reproduction of the same kinds of trees goes on in perpetuity,—barring the accident of oft-repeated fires, which destroys the trees and alters the physical conditions of both the soil and the climate, so that the same class of vegetation cannot exist,—without any diminution of vigour in the successive crops. All ages of trees may be seen in these forests, from the patriarch of a hundred or more years to the tiny seedling which has only started into existence with the current year, and all are alike promising and thrifty in their degree. This at least shows that where the soil and other conditions are favourable, there need be no question as to the propriety of planting newly cleared land with the same kind or kinds of trees as those which have occupied it for the comparatively limited period of fifty years. Your land in your position appears to be eminently well fitted for hardwood trees, such as oak, ash, beech, elm, and sycamore, and we should advise you to plant these and any others that the demand in your neighbourhood may suggest as desirable in preference to firs of any kind, except these are more marketable with you. Or the hardwoods may be planted with the intention of becoming the permanent crop, and larch and Scotch firs as nurses, to be removed in the course of thinning by and by.]

COUNT DE CARS' BOOK.

SIR,—My remarks on Count de Cars' *brochure* on pruning were directed against the abuse of the art.

I use it myself, and so cannot condemn others for using it, and should be very sorry to see landed proprietors cashier their foresters.

Some remarks by Mr. C. Y. Michie in *Gardeners' Chronicle* of 27th February 1886 would seem to show that he is quite capable of writing a manual on pruning, which would avoid what I take to be serious errors in the work above named, and be of service to young men learning forestry.

He says, "Like many others, I pruned much at an early period of my practice, and having had over a quarter of a century's experience of it, I am now induced to do comparatively little."

What my father called finger-pruning is very beneficial in young plantations. Merely rubbing off the terminal bud of a rampant shoot will often redress the balance.

Later in plantation life it seems to me best to remove branchy or unpromising trees altogether as the cuttings are made, and some promising forest trees which have room to throw out strong side branches or double heads may be ladder-pruned with advantage.

A friend of mine gave me a rule which I think judicious. Cut off two-thirds of a branch which is to be removed at a later period, one-third of a branch which is to be checked.

I wrote some papers in your valuable journal some time ago on the treatment of plantations without regular thinning. They elicited no reply from any forester, yet I am sure there is some sense in the practice which was adopted by a landowner who planted largely in Cornwall, as an adaptation of the conditions found in a natural forest to our artificial plantations.

If Mr. Farquharson ever comes to Plymouth, I hope he will be kind enough to write to me before he comes, and favour me with a call.—Yours faithfully,

H. Rogers.

Hartley, Plymouth, *26th March* 1886.

LEGAL.

THEFT OF TREES AT REDCASTLE.

In the Sheriff Criminal Court on February 22, two lads, Alexander Mackintosh and James Macrae, Arpafeelie, were charged before Sheriff Hill with having, during the month of January last, cut eleven birch and two larch trees in Parkton plantation, on the Redcastle estate, and appropriated them without sanction. The accused admitted the offence. Sheriff Hill, in passing sentence, said the two lads had pleaded guilty to a very serious charge, and it was not usual to impose a fine in a conviction for theft. He would, however, make an exception in the present case, and ordered the accused to pay a fine of £1, with the alternative of ten days' imprisonment. The fines were paid.

REVIEWS OF BOOKS.

THE *Scottish Geographical Magazine* for March contains an interesting paper by Colonel C. E. Stewart, C.B., C.M.G., C.I.E., giving a graphic description of a visit made by the gallant colonel to the Badghis in 1883, and to the Herat Valley in 1885. The paper contains a good deal of personal incident and excellent description of the condition of the countries traversed, and state of the tribes inhabiting, both in their political and social aspects.

The second paper in the *Magazine* is by Professor James Geikie, LL.D., F.R.S., entitled "Mountains; their Origin, Growth, and Decay." It is treated, as may be expected, by Mr. Geikie in an able manner, yet in a popular and readable style that renders the subject interesting to non-scientific readers. Some excellent diagrams illustrating the paper add much to the interest, as they render the understanding of the whole subject simple and complete. An article on "Baffin Land," by "A. S. W.," will be of some interest to readers of Arctic travel and exploration. The number contains also the usual report of the "Proceedings of the Society" for the month, along with copious and valuable "Geographical Notes," and a list of newly-published maps, making altogether a full and generally interesting number.

Report of the Commissioner of Agriculture on the Division of Forestry. United States, America.

THIS is a pamphlet embodying a report of the doings of the Division of Forestry of the Agricultural Department of the Government of the United States. The work of the division is that of "ascertaining the annual amount of consumption, importation, and exportation of timber and other forest products; the probable supply for future wants; the means best adapted to the preservation and renewal of forests; the influence of forests upon climate, and the measures that have been successfully applied in various countries for the preservation and restoration or planting of forests." The division has only limited means at its disposal to carry out this comprehensive programme, but it seems to have made the most of it. The report is divided into sections, some of them merely paragraphs, dealing with the different subjects that have been investigated or undertaken during the past year, and much interesting and practical information is the result.

Efforts have been made in recent years to establish trees on the western plains, or what is in the report called the Great American Desert, which have proved quite successful. Millions of trees have been planted in portions of Kansas and Nebraska States, formerly all but destitute of trees, which have grown and flourished. And on Cape Cod it has been found that, by planting groves of pine along the seaboard, it becomes easy, in the shelter they eventually afford from the salt spray and ocean storms, to establish any other kind of tree adapted to the latitude.

On the subject of the consumption of timber for railroad ties or sleepers alone, it appears that from 3 to 4 per cent. of the entire woodland of the United States, exclusive of Alaska, is annually required to meet the demand.

The maple-sugar industry seems, judging from the statistics of the report, a most important one. From this source alone, a little over one-twelfth of the whole sugar product of the country from all sources is derived. The sugar-maple is one of the most widely distributed of American trees; the sugar it yields is identical in composition with that of the sugar-cane; it is produced at small expense, and the tapping of the trees during the brief season when sugar may be made has no ill effect on the vitality of the trees, or on the quality of the timber for any purpose; so that it may be looked upon as one of the most valuable of American trees, taking all its products into account.

The present area of forests in the whole of the States is 489,280,000 acres, or 26·4 per cent. of the total area of the land. A table given in illustration of this part of the subject shows that the forest area is very unequal in proportion to the land in the various States, varying, as in the State of Maine, from 62·7 per cent. to 2·8 per cent. in Nevada.

On the subject of the increase or decrease of the forests, the inquiries instituted by the Department have confirmed the conclusions previously arrived at, namely, that American forests were decreasing all over the country rapidly, and in a large portion of it at an alarming rate. In Massachusetts and Connecticut, it appears the forest area is increasing as "the people are learning that much of their rough, hilly, swampy land is more profitable for the growth of trees than any other crop, and they are allowing nature to clothe it with the covering it formerly had."

Suspension of the sale of Government timber lands is recommended in the report wherever they are adjacent to the head-springs of rivers, or otherwise important to climatic influence or the general welfare of the land, as a wise policy, till by careful survey it may be ascertained what portion of them may be disposed of without injury to the country.

Progress Report of Forest Administration of British Burma for 1884–85. By Lieutenant-Colonel W. J. SEATON, M.S.C., and E. P. ROPERT, Esq.

THE total area of reserved forests in the district dealt with in this report is 3942 square miles, much of which is yet unsurveyed, in consequence of which the working administration is somewhat hampered. During the year, planting, sowing, and cultivating have been engaged in to the extent of 1748 acres. The revenue in gross has fallen 8,38,294 rupees, which is accounted for by the fall in the price of teak and by the unprecedented slackness in the timber market.

INDIAN FORESTRY REPORTS.

Progress Report of Forest Administration in Bengal for 1884–85. By A. L. HOME, Esq., Conservator of Forests.

A MOST voluminous report on one of the most important and extensive forest areas of our Indian Empire. The total area of reserved, protected and district forests amounts to 11,493 square miles, being an increase of over 230 square miles on the area under management last year. In the Darjeeling Division it appears the demand for timber and fuel has increased by 46 per cent., and that for charcoal has nearly doubled, and causes some anxiety as to the perpetuity of supply on the basis of 120 years' rotation, which is considered, with the area at disposal, inadequate; but data to prove the necessity for an extension of the area or allay the present fears are being collected. Success appears to have attended the attempts at fire-protection which have been extended to a wider area than formerly. Improved measures have been taken for the facilitating of natural production, the most novel of which is the dragging of light logs through the forests by elephants in order to open the surface soil for the reception of seed. There are 2000 acres of regular plantations, of which over 300 have been added during the year. The revenue from grazing is so insignificant as to suggest its being restricted to cases of necessity regarded purely from the point of view of forest conservancy, and rules are being considered with the view of regulating the practice accordingly. There is a falling off in the receipts for the year of 1,23,182 rupees, which is ascribed to causes of a temporary nature over which the officers of the forest department had no control.

OBITUARY.

WE regret to have to record the death of Mr. R. P. Ker, of Aigburth Nurseries and Basnett Street, Liverpool, which took place at his residence, Canning Street, Liverpool, on the 4th ult. Mr. Ker came of a stock of horticulturists. He was born on the 18th July 1816, at the once famous nurseries of Hassendean Burn, near Hawick, his father, Mr. Andrew Ker, having held the position of manager of these nurseries for twenty-five years, and his grandfather, Mr. John Ker, occupied the same position for forty years previously. His uncle, Mr. William Ker, travelled in China and afterwards was sent to Ceylon, where he died. The well-known shrub *Kerria* (*Corchorus*) *Japonica* was named after Mr. W. Ker. Mr. R. P. Ker began his career as a seedsman at the age of fourteen in the establishment of Messrs. Dickson & Co., of Waterloo Place, Edinburgh. At the termination of his apprenticeship he entered the employment of the late Mr. Skirving, of Liverpool, and represented that gentleman in Ireland, London, and elsewhere in England, at the same time acting as head of the seed department for about twenty years. Believing he was entitled to some share in a business which he had so largely contributed to build up, he made proposals with that view to Mr. Skirving, which that gentleman, however, declined. This led Mr. Ker to commence business on his own account in 1860, a step which he never had cause to regret, as the energy and excellent business capacity, strict probity of character, and the genial urbanity which secured him so much success in representing others quickly told in his own favour, and his business soon became one of the most thriving in the provinces. His nursery at Aigburth—one of the most beautiful suburbs of Liverpool—which he purchased in 1870, is replete with only what is good and valuable in trees and shrubs and hardy plants, and the collection of stove and greenhouse plants has acquired more than provincial fame for completeness, rarity, and excellence of culture. Mr. Ker has left three sons, two of whom have been his partners in the business for some years, and two daughters. The senior partner in the firm is now Mr. Robert Wilson Ker, a gentleman well and favourably known in the trade.

MISCELLANEOUS.

At a recent lecture delivered in Philadelphia by a prominent scientist, the gentleman said it takes a prodigious amount of vegetable matter to form a layer of coal; that the present growth of the world would make a layer only one-eighth of an inch thick, and that it would take a million years to form a coal-bed 100 feet thick.

Sicily now and then.—Look at Sicily, once the great grain reservoir for Rome. Since the island of plenty was despoiled of its forests, it gradually lost its fertility and the mildness of its climate. The ruins of proud and opulent Syracuse lay in a desert, covered by sand, which the hot sirocco carried over the Mediterranean Sea from Africa. A few isolated, well-watered, and carefully-cultivated districts of very limited extent, is all that is left to remind the tourist of the bygone glory of Sicily.

The Forest of Dean, 14 miles west of Gloucester, covers about 24,000 acres. The woods, originally planted for the supply of ships for the navy, are in good plight. The Royal Commission of 1871 reported that there are about 265,000,000 tons in the forest coal-fields. The output is about 900,000 a year. The Crown revenues from the coal and iron amount to some £10,000 to £12,000 a year.

Practical American Forestry.—If the planting of new forests go on as rapidly as it has gone in Kansas, there will soon be no occasion for weeping over the destruction of the old "tinder-box" forests that nature gave us. The assistance of the Government of Kansas appears to have been very successful in the aid of forestry, over 20,000,000 forest trees being under successful culture, and there are about 150,000 acres of artificially planted forest trees.

The Sexes in Hollies.—I can give definite assurance that the hedgehog in all its forms is of the masculine gender. In the course of some thirty years' observation, I have not seen a berry on any form of ferox, but some male hollies show an occasional berry. It cost me fully twenty years of watching to determine the sex of the beautiful waterer's holly, for in the record made of observations on my own collection it is entered as sometimes a male and sometimes a female, but as, generally speaking, being indisposed to flower. But I had the good fortune to settle the matter in the spring of the year 1879, when reviewing the flowers of the hollies in Messrs. Veitch & Sons' nurseries at Kingston. There I found on a waterer an unmistakable male flower, and I booked him as a male. In a few minutes, as the result of further search, I found an unmistakable berry, ripe and sound, containing hard nuts, and therefore, in all probability, fertile. Finally, before leaving these waterers, which numbered about thirty trees, 4 to 5 feet high, I found another male flower, and another perfect berry. My companion in this exploration was Mr. Dartnall, then manager of the nurseries at Kingston, and I asked him to keep in mind what he had seen. Now I can say without hesitation that trees producing both male and female flowers, or hermaphrodite flowers, are scarce. The holly, like some nobler organisms, is either male or female; very rarely does the individual tree represent both sexes. It may be assumed, therefore, that the pollen is for the most part carried by the wind, and as there is plenty of it, the fertilization appears not to present any serious problem. I pointed out some years ago, that when young holly trees begin to flower they often produce many male and very few female flowers; but they alter as time goes on, and a large proportion that began life as males become wholly female when more mature. Thus it happens that in an old plantation of common *Aquifolium*, a large proportion prove fruitful, but here and there we find a male that of course shows no berries.—*Shirley Hibberd in "Gardeners' Chronicle."*

Forest trees are now felled in America with dynamite. A cartridge of the explosive substance is placed in a channel bored directly under the tree to be operated upon, and when exploded the tree is simply forced up bodily and falls intact on its side. In most instances it is found that the tree is not fractured by the force of the explosion; a large proportion of valuable wood at the base of the trunk can be utilized which is now lost. For clearing forest properties this method is admirably adapted, as it brings up the root of the tree at the one operation, and dispenses with the tedious and costly process of grubbing the roots of the felled timber.

A New Use for Gladstone's Trees—Mr. Gladstone and Peterhead Correspondents.—The employees of Mr. William Barclay, joiner, Queen Street, Peterhead, in the course of last month, conceived the desire of becoming possessed of some tangible proof of the tree-felling powers of the "Grand Old Man," and applied to him for a piece of wood cut by him. They first received a reply from Mr. W. H. Gladstone inquiring whether they required a large or small piece; and having stated that the latter would suit their purpose, they have now received a piece of wood, along with a letter from the bailiff at Hawarden, as follows:—"W. H. Gladstone, Esq., desires me to send you by parcel post a small piece of oak, not exceeding 3 lbs., from a tree cut down by the Right Hon. W. E. Gladstone.—Yours faithfully, (Signed) A. Seaton." The wood is to be cut up into carved egg-cups.

THE historic island of St. Helena is said to have once been clothed with verdure and beauty, but its physical features have undergone a lamentable change. Its mountains have been denuded of their forests, and its soil has disappeared by constant washing, so that it has become a "stern, barren isle," which must, from present indications, ere long become uninhabitable. And all this has been brought about through the destruction of its trees.

TOOLS AND WORKMEN.—AN experienced foreman, who has an eye for philosophy, says that tools apparently partake of the temper of those who use them. A short-grained man has nicked bits; the impetuous man, broken ones; the lazy man, dull ones; the careless man, badly dressed ones; the man with one idea, one dress for all kinds of work; the soft man can rarely keep the edge of a tool from turning, while the good-natured and evenly-tempered man has the best tools in the shop, and is pestered continually by ill-tempered workmen who come to borrow from him whenever they have a particular piece of work to do. It is quite interesting to note the similarity in the temper of workmen and their tools.

CHERRY-WOOD, filed and not varnished, has a soft glow not possessed by any other, and has none of those distortions of grain that are so unpleasant in mahogany. The timber is chosen from the wild cherry, which in New England and the North does not usually grow to a girth of more than twenty inches, but in some of the Western States and the South frequently obtains a diameter of twenty-four inches. The domestic fruit cherry gives some good specimens of small timber, but as the tree is rarely sacrificed until it is past bearing and is decayed, the source of supply is precarious. The facility with which cherry can be worked makes it a favourite with cabinetmakers.

The Influence of Forests upon the Atmosphere, formed the subject of a paper read by Dr. G. L. Goodale, at a recent meeting of the Boston Society of Natural History. His conclusion, in brief, was that their influence is very slight. In regard to moisture, their direct action in throwing off moisture is, he said, insignificant; but their indirect action in holding back the water which has saturated the soil in rainfall is very great. Droughts and excessively dry atmosphere are consequent upon an extensive cutting away of forest growths. In the debate which followed it was stated, without question or contradiction, that two broad conclusions have been drawn heretofore, concerning the desert coasts of the south side of the Mediterranean Sea, and that other causes, besides the cutting off of forests, must be recognised as having effected, in part or wholly, the result now seen. One speaker thought it to be a matter of conjecture whether there ever were any forests there.

After a careful study of the subject, Professor P. D. Penhallow concludes that the formation of the so-called "annual rings" of growth in trees is chiefly determined by whatever operates to produce alternating periods of physiological rest and activity. In cold climates the rings are an approximately correct, but not always certain, index of age. In warm climates, however, the rings are of no value in this respect, as the growth is more likely to mark a period of rainfall than the yearly hot season of summer.

Monteath, in his *Forester's Guide*, strongly recommends the disbarking of trees in the spring before they are to be felled; and the effect in hardening the timber is certainly very great, but in a hot summer the exposed alburnum is apt to split more or less. A better mode has been found to be that of merely cutting out clean a rim, about four inches in width, of the bark close to the ground, which in larches seems to cause the turpentine to be wholly incorporated in the wood, instead of passing down to the roots; and, in fact, it so totally alters the condition of the trees that the workmen complain of their being much more difficult to saw. The effect of this process in establishing the straightness of the wood is, moreover, very beneficial. A ladder made from a larch so treated will be straight, while one not so seasoned will twist so as to be quite worthless.

Russian Marshes.—Russia has been for years engaged in draining the Pinsk marshes. They are situated on the Russo-Polish confines, and are very much larger than Ireland. In 1870, we believe, the Russian Government first took in hand seriously the draining of this territory, which, owing to being more or less submerged, and covered with a jungle growth of forest, prevented not only communication between the Russian districts on either side, but also between Russia and Austro-Germany. Consequently, a large staff of engineer officers and several thousand troops were drafted into the region, and these have been engaged on the undertaking since. Up to the present moment about 4,000,000 acres have been reclaimed, thanks to the construction of several thousand miles of ditches, and of canals so broad as to be navigable for barges of several hundred tons burden. Just now the engineers are drawing up the programme for next year, which comprises the drainage of 350,000 acres by means of the construction of 120 miles of ditches and canals. Of the 4,000,000 acres already reclaimed, 600,000 acres consisted of sheer bog, which have been converted into good meadow land; 900,000 acres of "forest tangle," which have been prepared for timber purposes by cutting down all the underwood and thinning the trees; 500,000 acres of good forest land, forest oases in the midst of the marshes, hitherto inaccessible, but which have been connected more or less with the navigable canals, and thereby with the distant markets; and finally, 2,000,000 acres have been thrown open to cultivation, although only 120,000 acres have been actually occupied up till now. Besides making the canals and ditches, the engineers have built 179 bridges, bored 152 wells from forty feet to eighty feet deep, and 425 from twenty feet to forty feet, and have made a survey of 20,000 square miles of country hitherto unmapped. When their task is finished, Russia will have effaced from the map of Europe one of the oldest and toughest bits of savage nature of the Continent, and a few years will suffice to render the Pinsk marshes indistinguishable from the rest of the cultivated region of the sources of the Dnieper. From an engineering, geological, and scientific point of view, the work is one of special interest.

ROBERT DOUGLASS, the best authority on the subject, claims that our native white spruce is superior to the Norway spruce in vitality. After the Norway spruce has reached the age of thirty years and assumed a grand size it begins to decay, first by loss of its foliage near the trunk, and which gradually extends toward the extremities of the branches, and then its leader dies, and the annual lateral growth is very small, and the whole tree takes on a rusty, unhealthy appearance, its disfigurement increasing until death ensues. The white spruce, *Abies alba*, is a much longer-lived tree; it is of slower growth than the Norway spruce, but continues in vigour long years after the latter has lost all claims to beauty. In planting it is best to group these two trees together in such a manner that a good effect will be retained when, on account of old age, the Norway spruce shall have been removed.—*Vick's Magazine for December.*

THE LOTUS TREE.—It is not often, says the *St. James's Gazette*, that we find elucidations of ancient and modern poets in a Blue Book, and we must not grumble if the effect is to reduce them to prose. In a very interesting report of an official visit made to our vice-consular ports in Tunis by Colonel Playfair, Her Majesty's Consul at Algiers, which has just been issued, there is a notice of the island of the Lotophagi, the modern Djerba. Here is the first mention of the spot, translated by Colonel Playfair from the *Odyssey*, Book IX. :—" On the tenth day we set foot on the land of the lotus-eaters. . . . Now, when we had tasted meat and drink, I sent forth certain of my company to go and make search what manner of men they were who live here upon the earth by bread; and I chose out two of my fellows, and sent a third with them as herald. Then straightway they went and mixed with the men of the lotus-eaters; and so it was that the lotus-eaters devised not death for our fellows, but gave them of the lotus to taste. Now whosoever of them did eat the honey-sweet fruit of the lotus had no more wish to bring tidings nor to come back ; but there he chose to abide with the lotus-eating men, ever feeding on the lotus, and forgetful of his homeward way." Hitherto this seductive fruit has been assumed to be the jujube, or fruit of the zizyphus. But Colonel Playfair remarks that this plant, though common in Algiers, is not to be found in Djerba; and, besides that, no human being who ever tasted its fruit would care to do so again; and, in fact, neither man nor animals could subsist on it. But the true lotus, he is convinced, is the date. The island is covered to this day with date-palms, the fruit is of excellent quality, and exactly described by the epithet " honey sweet," and it is in itself a complete food for man. Besides, he maliciously adds, " the wine made from the sap of the tree is as familiar as the fruit itself, and may have contributed to render the sailors ' oblivious of their homeward way.' "

A FOSSIL oak has been discovered in the bed of the Rhone—dark as ebony, hard as iron, supposed to have been 3000 years in the bed of the river. This tree is 150 feet high, 58 feet cube, and considerably over 120,000 pounds in weight. This reminds one of other phenomenal trees. As, for example, the oak of Allouville, bearing a chapel in its branches; the chestnut of Ætna, covering thirty horsemen; the tree of Augustus, in the hollow of which Caligula gave a dinner to thirty guests; the plantain of Xerxes, which sheltered himself and one hundred guardsmen; the plantain of Cos, whose trunk measures 30 feet in circumference, and whose branches are propped up by marble columns. In the churchyard of Haye de Routot in Normandy, there is an immense yew that once covered the whole cemetery. It is 180 years old, and grows every day.

CANADIAN FORESTS.—An English traveller, writing on this subject, says: " I was never tired of the forest scenery of America, the endless diversity of its foliage always preventing it from being monotonous. A stranger gazing for the first time on the unbroken forest is peculiarly struck with admiration at the surprising and, to him, novel scenery it presents—a scenery peculiarly its own. A wide expanse of unknown extent, canopied above by the dark mass of spreading foliage; countless columns of trunks which, far as the eye can reach, mile after mile, rise tall and erect, supporting that living roof, and long drawn vistas through which the eye seeks in vain to penetrate the depth of the forest solitude;—such is the scene which meets the eye. But it is when the first frost has touched the trees, and the change of colour in the leaves has set in, the forests put on their greatest beauty. Each kind has its own hue—above all the maple—and every hue is lovely. The leaf of the maple, the first to colour, remains throughout the most beautiful in its golden yellow and crimson. Lofty trees and humble undergrowth, and climbing creepers, all alike deck the landscape with every tint that can be borrowed from the light, till the whole looks like the scenery of a fairy tale, and presents a spectacle unknown to the residents of the Old World. Two or three frosty nights in the decline of autumn transform the boundless verdure of a whole empire into every possible tint of brilliant scarlet, rich violet, every shade of brown, vivid crimson, and glittering yellow. The stern, inexorable fir tribes alone maintain their eternal sombre green; all others, in mountains or in valleys, burst into the most georgeous vegetable beauty, and exhibit the most splendid and most enchanting panorama on earth."

THE trees may outlive the memory of more than one of those in whose honour they were planted. But if it is something to make two blades of grass grow where only one was growing, it is much more to have been the occasion of the planting of an oak which shall defy twenty scores of winters, or of an elm which shall canopy with its green cloud of foliage half as many generations of mortal immortalities. I have written many verses, but the best poems I have produced are the trees I planted on the hill-side which overlooks the broad meadows, scalloped and rounded at their edges by loops of the sinuous Housatonic. Nature finds rhymes for them in the recurring measures of the seasons. Winter strips them of their ornaments, and gives them, as it were, in prose translation, and summer re-clothes them in all the splendid phrases of their leafy language. What are these maples and beeches and birches but odes and idyls and madrigals? What are these pines and firs and spruces but holy hymns, too solemn for the many-hued raiment of their gay deciduous neighbours?—OLIVER WENDELL HOLMES.

SANDAL-WOOD (*Santalum album*).—This valuable production of Indian forests has but a very limited distribution, being confined to certain localities in South India, and to a few islands of the Eastern or Malay Archipelago. The tree is an evergreen, and seldom attains 25 feet in height. There are many other trees, besides the *Santalum album*, which come under the designation of "sandal-wood," notably the far-famed *sapan* wood so largely used in China, and imported into that country from the isles of the Banda or Flores Sea. The essential oil obtained from the distillation of the heart-wood and roots of the true variety, or *Indian* sandal-wood, is used as the basis of nearly all ottos manufactured in the country. The perfume has a peculiar fragrance much appreciated in the Hindoo toilette. The paste obtained by rubbing the wood on a stone with a little water is used for painting the body after bathing. These *shandana* marks are used as caste characteristics by the natives—in South India more especially. The wood enters largely into the religious ceremonies of the Hindoos. An emulsion of the wood is given as an offering to the gods, while the wood itself is often used, partially or totally, in the funeral pyres of the more well-to-do classes. Sandal-wood carving is an established industry in some parts of the country. The boxes, and other elegant articles made with the wood, are too well known to need description. Nor do the uses of the tree end here. The wood has always occupied a prominent place in the Hindoo pharmacopœia, and the oil is largely prescribed by European physicians in a peculiar class of diseases. The paste is used as a local application in cutaneous eruptions. The effect internally is said to be cooling, and is therefore prescribed largely by the *kobiraj* or *hakim* for "fever, thirst, and heat of the body."

TREES FOR AVENUES.—One of the greatest mistakes made by corporations of property is to plant too many varieties of trees along the side-walk. One kind only should be selected for each avenue or street, and this should possess the requisites of rapid growth, shapely head, compact form, and freedom from diseases and injurious insects. Each of the leading trees adapted to this purpose has its advocates, but the one most highly in favour near our large cities at present is the *Oriental Plane*. When grown quickly, nursery trees of this species have a straight stem, which may be trimmed high, another important feature to be always observed. For very rapid growth, combined with other good qualities, the *American Linden* may very safely be recommended for avenues, although it does not form a compact head. The *Norway Maple* has made hosts of friends everywhere, but it has one serious fault when used as a street tree—an inclination to droop its branches, no matter how high it may be trimmed. On the lawn it has no superior, however, and is the perfection of beauty in outline and colour.

THE LARCH.—In his extremely interesting work, *La Flore de la Suisse et ses Origines*, Dr. H. Christ gives a good deal of useful and interesting information about the larch, which is the characteristic tree of the central Alps. Thanks to its foliage of fine delicate needles, which fall at the approach of winter, it supports better than any other tree the excessive dryness and the severity of winter frosts. Its rough thick furrowed bark bears some resemblance to that of the oak, but it is a brighter colour, a more decided red. The *Evernia vulpina*, a beautiful citron-yellow lichen, clothes it with a more brilliant covering than any furnished to other Swiss trees by any other lichen or moss. When young, the Swiss larch has a perfectly straight stem, and it is only at an advanced age that some of its branches thicken—after the fashion of those of the oak—spread outwards and recurve, thus giving to the tree more character and individuality. It often attains colossal dimensions, and it is by no means rare to meet with trees 80 feet in height, with a trunk 6 feet in diameter. The report to the Federal Council on the mountain forests mentions one in the Alps of Vaud, which, at a height of 9 feet, measured 8 feet in diameter, and was only 270 years old. The wood of the larch is very valuable, for it withstands the influences of air and water equally well. In the canton of Valais there are many châlets, constructed of larch, dating from the fourteenth century; the wood is entirely blackened by the sun, but it is as firm and sound as recent timber.—*Gardeners' Chronicle.*

Fossil Wood.—An interesting paper has been communicated to one of the California scientific societies on the fossil wood found throughout the State. This silicified wood is stated to be a variety of quartz; the wood fibre is gradually replaced by quartz, leaving the form of the wood intact, so much so that sections cut and placed under a microscope show the characteristic grain of the wood, by which the genera may often be determined, and sometimes the species. In what is known as the petrified forests in Colorado, where are stumps of trees several feet in height and some 12 or 15 feet in diameter, one stump seemed to have been fossilized while in a charred state, and from it fossil charcoal was obtained. Many of the specimens of wood are encrusted with layers of crystallized chalcedony of an opalescent tint, so beautiful that sections have been mounted and worn as jewellery. In Wyoming there have been found sections of trees 20 inches in diameter and several feet in length, like hollow tubes, with the interior surface entirely studded with pure quartz crystals, presenting a most beautiful appearance.

A plan for rendering paper as tough as wood or leather, it is said, has been recently introduced on the Continent. It consists in mixing chloride of zinc with the pulp in the course of manufacture. It has been found that the greater the degree of concentration of the zinc solution, the greater will be the toughness of the paper. It can be used for making boxes, combs, for roofing, and even for making boots.

CHIPS.

In the arctic region there are 762 kinds of flowers. Fifty of these are confined to the arctic region.

By washing a pine floor with a solution of one pound of copperas in one gallon of strong lye, the appearance of oak flooring may be produced.

Recent surveys show that Russian forests generally reach their northern limit at 71° of latitude, but near the Lena they extend nearly to 72°.

Somebody has taken the pains to calculate that the United States produce enough lumber each year to load 1,428,581 railroad cars, each carrying 7000 feet. It is also said that this would make a train 8500 miles long, or about one-third around the world.

Evidence of the decay of forests in Australia is found in the present existence of a few trees far exceeding in size any of those about them, and supposed to be survivors of a departed race of giants. A tree twenty-five feet in circumference at a height of thirty feet above the ground was described at a late meeting of the Royal Society of New South Wales.

The relative value of wood or steel for railway sleepers is a matter of very general discussion in Europe. As England pays to Russia, Norway, and Sweden nearly 1,500,000 dols. annually for wooden ties, she is naturally anxious to keep her money at home in the encouragement of the steel industries. With the present low cost of wooden sleepers in most parts of the United States, it will be many years before the steel tie comes into general use. The adoption of the steel tie, however, in foreign countries, now large importers of wood, is of interest to lumbermen everywhere.

Chlorophyll.—Mr. Gilbert showed in some experiments that pure nitrogen manures produced more chlorophyll than nitrogen and ash manures mixed, but that under the latter far more *carbon* was assimilated than under the former treatment. Potash is as essential for the assimilating power of chlorophyll as iron is for its formation.

For many years it has been one of my constant regrets that no schoolmaster of mine had a knowledge of natural history, so far, at least, as to have taught me the grasses that grow by the wayside, and the little, wingless neighbours that are continually meeting me with a salutation which I cannot answer, as things are.—*Thomas Carlyle.*

The inner bark of *Pinus contorta*, a species of British Columbia, contains a sugary substance which, although not manufactured in any way, is used by the natives largely. They pull long strips of it off the trees, and dry them for future use, chewing it like tobacco.

The quantity of sugar manufactured annually in the several provinces of Canada from the sap of the sugar-maple and other species of the same genus which yield sugar, is said to be 20,556,049 pounds, and it averages from 10 to 12½ cents per pound.

The barking of oak has become a rather unremunerative work of late, leaving but a small margin after the cost of removing, harvesting, and sending it to its destination is incurred. Nor is all bark of the same quality, as is well known; certainly that from the most valuable trees is not always the best appreciated in the market. On the contrary, a higher price is generally obtained from that which is obtained from small trees and coppice poles than from heavier and older trees.

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